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OF THE

New England Water Works Association.

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OFFICERS

OF THE

New England Water Works Association.

1902.

PRESIDENT.

FRANK E. MERRILL, Somerville, Mass.

VICE-PRESIDENTS.

CHARLES K. WALKER, Manchester, N. H.
JAMES BURNIE, Biddeford, Me.
EDWIN C. BROOKS, Cambridge, Mass.
H. O. SMITH, Leicester, Mass.
WILLIAM B. SHERMAN, Providence, R. I.
J. C. HAMMOND, Jr., Rockville, Conn.

SECRETARY.

WILLARD KENT, Narragansett Pier, R. I.

TREASURER.

LEWIS M. BANCROFT, Reading, Mass.

EDITOR OF THE JOURNAL.

CHARLES W. SHERMAN, Boston, Mass.

ADVERTISING AGENT.

ROBERT J. THOMAS, Lowell, Mass.

ADDITIONAL MEMBERS OF EXECUTIVE COMMITTEE.

PATRICK KIERAN, Fall River, Mass.
GEORGE A. STACY, Marlboro, Mass.
HORACE G. HOLDEN, Nashua, N. H.

FINANCE COMMITTEE.

A. W. F. BROWN, Fitchburg, Mass.
WILLIAM F. CODD, Nantucket, Mass.
J. W. CRAWFORD, Lowell, Mass.

THE ASSOCIATION was organized in Boston, Mass., on June 21, 1882, with the object of providing its members with means of social intercourse and for the exchange of knowledge pertaining to the construction and management of water works. From an original membership of only TWENTY-SEVEN, its growth has prospered until now it includes the names of over **600** men. Its membership is divided into two principal classes, viz.: MEMBERS and ASSOCIATES. Members are divided into two classes, viz.: RESIDENT and NON-RESIDENT, — the former comprising those residing within the limits of New England, while the latter class includes those residing elsewhere. The INITIATION fee for the former class is FIVE dollars; for the latter THREE dollars. The annual dues for both classes of Active membership are THREE dollars. Associate membership is open to firms or agents of firms engaged in dealing in water-works supplies. The initiation fee for Associate membership is TEN dollars, and the annual dues FIFTEEN dollars. This Association has six regular meetings each year, all of which, except the annual convention in September, are held at Boston.

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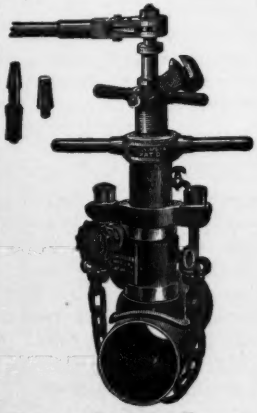

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NEW ENGLAND WATER WORKS ASSOCIATION.

ORGANIZED 1882.

Vol. XVI. March, 1902. No. 1.

This Association, as a body, is not responsible for the statements or opinions of any of its members.

CONSTITUTION OF THE NEW ENGLAND WATER WORKS ASSOCIATION.

[*Adopted September 19, 1900.*]

ARTICLE I.

NAME AND OBJECT.

SECTION 1. The name of this society shall be THE NEW ENGLAND WATER WORKS ASSOCIATION.

SECT. 2. Its objects shall be the advancement of knowledge relating to water works and water supply, and the encouragement of social intercourse among water works men.

ARTICLE II.

SECTION 1. The membership of the Association shall consist of Members, Honorary Members, and Associates.

SECT. 2. Water works superintendents or other executive officers, commissioners or members of Water Boards, hydraulic engineers, sanitarians or other persons qualified to aid in the advancement of knowledge relating to hydraulic questions, shall be eligible as Members.

SECT. 3. Members only shall be eligible to office and entitled to the right to vote.

SECT. 4. Associates shall be firms or representatives of firms engaged in dealing in supplies used by water works.

SECT. 5. Members hereafter elected engaging in the business of furnishing water works supplies shall cease to be Members of the Association and their names shall be transferred to the list of Associates.

SECT. 6. Associates shall be entitled to representation at each meeting of the Association, but shall not be entitled to vote or to take part in any discussion unless permission is given by the meeting.

SECT. 7. Honorary Members shall be men eminent in some line of work connected with hydraulic engineering or water supply.

SECT. 8. Members shall be classed as Resident or Non-Resident; the

former comprising residents of the New England States, all others being Non-Resident Members.

ARTICLE III.

ADMISSIONS AND EXPULSIONS.

SECTION 1. An application for admission to the Association as Member or Associate shall embody a concise statement of the candidate's qualifications for membership, and shall be endorsed by two Members of the Association.

SECT. 2. Applications for membership shall be considered by the Executive Committee, who shall present them to the Association for ballot, provided a majority are in favor of such action.

SECT. 3. Election to membership shall be by ballot, and shall require two thirds of the ballots cast.

SECT. 4. Members and Associates elect shall subscribe their names to the Constitution by signing a form to be furnished by the Secretary.

SECT. 5. Any person who shall be in arrears to the Association for two years' dues shall be notified by the Secretary that if payment is not made within three months his name will be dropped from the roll; and if such arrears are not paid within the time specified, the Secretary shall erase the name from the membership list.

SECT. 6. A member of any grade may withdraw from the Association by giving written notice to the Secretary and settling all indebtedness to the Association.

SECT. 7. A member of any grade may be expelled from the Association upon the recommendation of the Executive Committee, adopted by a two-thirds vote of the members present and voting at any regular meeting.

ARTICLE IV.

DUES.

SECTION 1. The Initiation Fee shall be—

For Resident Members . . .	$5.00
For Non-Resident Members . . .	3.00
For Associates	10.00

SECT. 2. The Annual Dues shall be—

For Members	$3.00
For Associates	15.00

which shall include a subscription to THE JOURNAL OF THE NEW ENGLAND WATER WORKS ASSOCIATION.

SECT. 3. A person transferred from the grade of Member to that of Associate shall not be assessed an additional initiation fee, but shall be liable for dues as an Associate.

ARTICLE V.

OFFICERS.

SECTION 1. The officers of this Association shall be a President, six Vice-Presidents, not more than three of whom shall be residents of the same State, a Secretary, and a Treasurer; these, together with the Editor and Advertising Agent of THE JOURNAL OF THE NEW ENGLAND WATER WORKS ASSOCIATION and three other Members, shall constitute the Executive Committee, in whom the government of the Association shall be vested.

SECT. 2. The term of office of all officers and committees shall be one year, but shall continue until their successors are duly elected.

SECT. 3. There shall also be a Finance Committee of three Members of the Association other than members of the Executive Committee.

SECT. 4. All officers and committees shall assume their duties immediately after the close of the meeting at which they have been elected.

ARTICLE VI.

DUTIES OF OFFICERS.

SECTION 1. The President shall have a general supervision of the affairs of the Association. He shall preside at meetings of the Association and of the Executive Committee. In case of his absence or a vacancy in his office, the Vice-Presidents in order of seniority shall discharge his duties.

SECT. 2. The Executive Committee shall have full control of the management of the Association, subject to the action of the Association at any meeting. They shall make the necessary arrangements for all meetings, and shall have power to expend the funds of the Association, provided that no indebtedness shall be incurred in excess of the funds in the hands of the Treasurer. All questions in Executive Committee shall be decided by a majority vote, and six members shall be a quorum. The Executive Committee shall hold meetings at the call of the President, or, in his absence or inability to serve, at the call of the senior Vice-President.

SECT. 3. The Secretary shall conduct the official correspondence of the Association, shall collect and receipt for all fees and dues, and transmit the same to the Treasurer quarterly, taking his receipt therefor; he shall issue notices of all meetings of the Association at a date not less than two weeks prior to the time appointed for such meetings. He shall make a report to the Association at the annual meeting of the general condition of the Association and especially of changes in the membership.

SECT. 4. The Treasurer shall receive from the Secretary all moneys collected by him for the Association, giving his receipt therefor, and shall pay all demands against the Association when approved by the President. He shall keep a proper account of all receipts and expenditures, and shall make a report to the Association, at the annual meeting, of his doings as

Treasurer during the year preceding, together with a statement of the financial standing of the Association.

SECT. 5. The Finance Committee shall meet on or before the day of the annual meeting, and shall audit the accounts of the Secretary and Treasurer. They shall hold such other meetings as the interests of the Association may require.

SECT. 6. The proceedings of the Association shall be published as THE JOURNAL OF THE NEW ENGLAND WATER WORKS ASSOCIATION, which shall be issued quarterly, under the direction of a Board of Editors, consisting of the President and Secretary, *ex officiis*, and the Editor and Advertising Agent chosen by ballot. The Journal shall contain such portion of the record of any meeting as the Board of Editors may deem it expedient to publish, as well as any other articles which they shall consider of interest to the Association.

SECT. 7. The Editor of THE JOURNAL OF THE NEW ENGLAND WATER WORKS ASSOCIATION shall, under the direction of the Board of Editors, keep and prepare for publication all matters intended to be printed in the Journal, and shall act as the executive officer of the Board of Editors. He shall present a report at the annual meeting, showing in detail the cost of publication of the Journal and the receipts from advertising and subscriptions.

ARTICLE VII.

NOMINATION AND ELECTION OF OFFICERS.

SECTION 1. At the business meeting during the annual convention the Association shall elect or appoint, in such manner as may be approved by the meeting, a Nominating Committee of five members, who shall present a report before the first day of November, in the form of a list of nominations for officers for the ensuing year. This report shall be printed and mailed by the Secretary to the membership of the Association.

SECT. 2. At any time before December 1, any ten or more Members of the Association may send to the Secretary additional nominations signed by such Members.

SECT. 3. The Secretary shall issue a printed ballot on the fifteenth day of December, which shall contain the nominations made by the Nominating Committee and such other nominations as may have been received by him in accordance with Section 2. This ballot shall be mailed to all members entitled to vote.

SECT. 4. Ballots may be sent by mail to the Secretary or handed to him directly. They must be enclosed in two sealed envelopes, and the outer envelope shall be endorsed by the voter's signature.

SECT. 5. The polls shall be closed one hour after the time of opening the Annual Meeting, and the ballots shall be canvassed by tellers appointed by the presiding officer. The persons receiving the highest number of votes for the offices for which they are candidates shall be declared elected.

ARTICLE VIII.

MEETINGS.

SECTION 1. A Convention of the Association for the reading and discussion of papers and for social intercourse shall be held annually at such time and place as may be determined by the Executive Committee.

SECT. 2. There shall be two general business meetings of the Association each year; first, the annual meeting, which shall be held in Boston on the second Wednesday in January, and at which the annual reports for the year ending December 31 shall be presented, and the ballot for officers canvassed; and second, a business meeting during the annual convention.

SECT. 3. In addition to the above, business meetings shall be held on the second Wednesday of the months of November, December, February, and March, and, at the discretion of the Executive Committee, in June.

SECT. 4. At any business meeting of the Association, twenty members shall constitute a quorum.

SECT. 5. All regular meetings of the Association, except the annual convention, shall be held in Boston, unless otherwise voted by the Executive Committee.

SECT. 6. Special meetings of the Association may be held at the call of the President. At special meetings no applications for membership shall be considered, and no business shall be transacted unless announced in the call for the meeting and on the recommendation of the Executive Committee.

SECT. 7. Meetings of the Executive Committee shall be held before each business meeting of the Association and at such other times as the President may deem necessary.

ARTICLE IX.

AMENDMENTS.

SECTION 1. Proposed amendments to this Constitution must be submitted in writing to the Executive Committee, and shall be presented to the Association at a regular meeting, if so decided by vote of the committee. It shall be the duty of the Executive Committee to bring before the Association any proposed amendment at the written request of ten Members.

SECT. 2. Announcements of a proposed amendment which is recommended by the Executive Committee, or by ten Members of the Association, shall be given by printing the amendment in the notices of the regular meeting. A two-thirds vote of the members present and voting shall be necessary for the adoption of an amendment.

OFFICERS

OF THE

New England Water Works Association.

1902.

PRESIDENT.

FRANK E. MERRILL.

VICE-PRESIDENTS.

CHARLES K. WALKER.
JAMES BURNIE.
EDWIN C. BROOKS.
H. O. SMITH.
WILLIAM B. SHERMAN.
J. C. HAMMOND, JR.

SECRETARY.

WILLARD KENT.

TREASURER.

LEWIS M. BANCROFT.

EDITOR.

CHARLES W. SHERMAN.

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ROBERT J. THOMAS.

ADDITIONAL MEMBERS OF EXECUTIVE COMMITTEE.

PATRICK KIERAN.
GEORGE A. STACY.
HORACE G. HOLDEN.

FINANCE COMMITTEE.

A. W. F. BROWN.
WILLIAM F. CODD.
J. W. CRAWFORD.

PAST PRESIDENTS.

*JAMES W. LYON, 1882–83.
FRANK E. HALL, 1883–84.
GEORGE A. ELLIS, 1884–85.
ROBERT C. P. COGGESHALL, 1885–86.
*HENRY W. ROGERS, 1886–87.
*EDWIN DARLING, 1887–88.
*HIRAM NEVONS, 1888–89.
DEXTER BRACKETT, 1889–90.
*ALBERT F. NOYES, 1890–91.
HORACE G. HOLDEN, 1891–92.
GEORGE F. CHACE, 1892–93.
*GEORGE E. BATCHELDER, 1893–94.
GEORGE A. STACY, 1894–95.
DESMOND FITZGERALD, 1895–96.
*JOHN C. HASKELL, 1896–97.
WILLARD KENT, 1897–98.
FAYETTE F. FORBES, 1898–99.
BYRON I. COOK, 1899–1900.
FRANK H. CRANDALL, 1901.

* Deceased.

LIST OF MEMBERS,

WITH ADDRESS AND DATE OF ELECTION.

[*Corrected to February 1, 1902.*]

NAME.	Date of Election.
Adams, John D. Supt. Water Works, Provincetown, Mass.	Sept. 8, 1897
Allen, Charles A., C. E. 44 Front Street, Rooms 109, 110, Worcester, Mass.	June 16, 1886
Allen, Charles F. Treasurer Water Co., Hyde Park, Mass.	June 16, 1886
Amyot, John A., M. B. Bacteriologist to the Provincial Board of Health of Ontario, 305 Joseph Street, Toronto, Canada.	Nov. 14, 1900
Anderson, J. M. 246 Pleasant Street, Worcester, Mass.	Jan. 9, 1901
Andrews, Frank A. Assistant Supt. Pennichuck Water Works, Nashua, N. H.	Dec. 14, 1887
Anthony, Charles, Jr. Casilla 1045, Buenos Aires, South America.	June 12, 1901
Appleton, Francis E. Paymaster Locks & Canals Co., Lowell, Mass.	Dec. 8, 1897
Armstrong, S. G., C. E. 1 Kimberly Villa, Harrington Street, Cape Town, South Africa.	Feb. 13, 1895
Babcock, Stephen E. Water Works and Hydraulic Engineer, Little Falls, N. Y.	June 12, 1886
Bacot, R. C., Jr. Supt. Meter Dept., P. O. Box 221, Port Chester, N. Y.	Dec. 12, 1888
Badger, Frank S. 28 Bellevue Street, Lowell, Mass.	June 10, 1896
Bagnell, Richard W. Plymouth, Mass.	Dec. 21, 1882
Bailey, E. W. City Engineer, Somerville, Mass.	Dec. 11, 1895
Bailey, Frank S. State Board of Health, State House, Boston, Mass.	Sept. 8, 1897
Bailey, George I. Consulting Engineer, 51 State Street, Albany, N. Y.	Dec. 14, 1892
Baker, M. N. Associate Editor "Engineering News," 220 Broadway, New York City.	Sept. 18, 1901
Baldwin, Charles H. 159 Franklin Street, Boston, Mass.	June 17, 1887
Bancroft, Lewis M. Supt. Water Works, Reading, Mass.	Jan. 8, 1890
Barbour, Frank A., C. E. 1120 Tremont Building, Boston, Mass.	Jan. 10, 1894

NAME.	Date of Election.
Barnes, Roland D., C. E. 23 Spring Street, Malden, Mass.	June 14, 1899
Barrus, George H. Consulting Steam Engineer, 12-20 Pemberton Building, Pemberton Square, Boston, Mass.	Jan. 14, 1891
Bartlett, Charles H., C. E. 607 Pemberton Building, Boston, Mass.	Feb. 8, 1893
Bartlett, R. S. Supt. Water Works, Norwich, Conn.	Jan. 13, 1897
Bassett, Carroll Ph. Treasurer Water Co., Summit, N. J.	June 13, 1889
Bassett, George B., C. E. 363 Washington Street, Buffalo, N. Y.	Sept. 10, 1897
Batchelder, George W. Water Registrar, Worcester, Mass.	June 14, 1899
Batcheller, Francis Water Commissioner, North Brookfield, Mass.	Jan. 10, 1894
Bates, Oren B. Clinton, Mass.	Sept. 11, 1895
Bates, Hon. Theodore C. 29 Harvard Street, Worcester, Mass.	Jan. 10, 1894
Beals, Joseph E. Supt. Water Works, Middleboro, Mass.	June 16, 1886
Beardsley, Joseph C. 2d Asst. Engr. Cleveland Water Works, Cleveland, Ohio.	Sept. 18, 1901
Beasom, C. B., C. E. 248 Tremont Street, Newton, Mass.	Dec. 12, 1894
Bemis, Edward W. Supt. Water Works, Cleveland, Ohio.	Nov. 13, 1901
Bennett, Thomas H. Supt. Water Works, Oswego, N. Y.	March 14, 1900
Benzenberg, G. H. Milwaukee, Wis.	June 9, 1892
Berkey, John A. President Electric and Water Co., Little Falls, Minn.	Feb. 8, 1893
Bettes, Charles R. Chief Engineer, Queen's County Water Co., Far Rockaway, N. Y.	Dec. 9, 1896
Betton, James M. 10 East 16th Street, New York City.	Jan. 8, 1902
Bigelow, James F. City Engineer, Marlboro, Mass.	Sept. 11, 1895
Birkinbine, Henry Hydraulic Engineer, 124 East Market Street, York, Pa.	June 17, 1887
Bisbee, Forrest E. Supt. Water Works, Auburn, Me.	Sept. 11, 1895
Bishop, George H., C. E. 129 Main Street, Middletown, Conn.	June 16, 1886
Bishop, Watson L. Supt. Water Works, Dartmouth, N. S.	March 8, 1893
Blackmer, James W. Supt. Water Works, Beverly, Mass.	March 8, 1899

Name.	Date of Election.
Blossom, William L., C. E. 355 Washington Street, Brookline, Mass.	Dec. 13, 1893
Boggs, Edward M. Consulting Civil and Hydraulic Engineer, 534 Stimpson Block, Los Angeles, Cal.	Dec. 11, 1889
Bowers, George City Engineer, Lowell, Mass.	March 9, 1892
Boyer, Francis H. 13 Highland Avenue, Somerville, Mass.	June 12, 1901
Brackett, Dexter Engineer Distribution Dept., Metropolitan Water Works, 1 Ashburton Place, Boston, Mass.	April 21, 1885
Bradley, R. H. Supt. Water Works, LeSueur, Minn.	Dec. 14, 1892
Brinsmade, Daniel S. President and Engineer Ousatonic Water Co., Birmingham, Conn.	Sept. 19, 1883
Broatch, J. C. Supt. Water Works, Middletown, Conn.	April 21, 1885
Brooks, Edwin C. Supt. Water Works, Cambridge, Mass.	Feb. 10, 1897
Brooks, Fred 31 Milk Street, Boston, Mass.	Feb. 8, 1899
Brown, A. W. F. Water Registrar, Fitchburg, Mass.	June 17, 1887
Brown, J. Henry 3 Tremont Street, Charlestown, Mass.	Sept. 19, 1883
Brown, Walter I. Water Registrar, Bangor, Me.	June 11, 1896
Brownell, Ernest H., C. E. Brownell Block, 107 Westminster Street, Providence, R. I.	Jan. 11, 1893
Bucknam, George A. P. Supt. Water Works, Norwood, Mass.	June 10, 1891
Burke, James E. Sec'y, Treas., and Supt. Princeton Water Co., Princeton, N. J.	Sept. 11, 1895
Burley, Harry B. 31 Milk Street, Room 55, Boston, Mass.	Dec. 14, 1892
Burnham, Albert S. Supt. Water Co., Revere, Mass.	June 13, 1888
Burnie, James Supt. Water Co., Biddeford, Me.	June 11, 1890
Burns, Clinton S. 409 Postal-Telegraph Building, Kansas City, Mo.	Dec. 12, 1900
Burr, William H. Professor of Civil Engineering, Columbia University, and Consulting Engineer, New York City.	Feb. 16, 1894
Burse, A. H. Supt. Water Works, Pittsfield, Me.	Sept. 16, 1898
Bush, Edward W., C. E. Ætna Life Building, Hartford, Conn.	Feb. 13, 1895
Butler, J. Allen Supt. Portland Water Co., Portland, Conn.	June 10, 1891

NAME.	Date of Election.
Cairns, R. A. City Engineer, Waterbury, Conn.	Feb. 13, 1895
Card, Huber D. City Engineer, Willimantic, Conn.	Jan. 8, 1896
Carpenter, L. Z. Attleboro, Mass.	Dec. 13, 1899
Carroll, Fred B. Rumford Falls, Me.	Dec. 12, 1888
Cassell, George Supt. Water Works, Chelsea, Mass.	March 8, 1899
Caulfield, John Sec'y Water Works, St. Paul, Minn.	Dec. 8, 1897
Cavanagh, John T. Quincy, Mass.	Feb. 8, 1893
Chace, George F. Supt. Water Works, Taunton, Mass.	June 13, 1888
Chadbourne, E. J. Supt. Water Co., Wakefield, Mass.	June 18, 1885
Chandler, Charles E. City Engineer, 161 Main Street, Norwich, Conn.	June 17, 1887
Chandler, Prof. Charles F. 51 East 54th Street, New York City.	Dec. 12, 1888
Chapin, G. L. Water Commissioner, Lincoln, Mass.	March 10, 1897
Chapman, Benjamin R. Asst. Engineer, Brockton, Mass.	Feb. 9, 1898
Chase, John C. Chief Engineer Water Works Co., Derry, N. H.	June 19, 1884
Clapp, Sidney K. Waterbury, Conn.	Jan. 10, 1900
Clapton, William Supt. Water Co., Newtown, N. Y.	Sept. 11, 1895
Clark, D. W. President Water Co., Portland, Me.	June 12, 1890
Clark, Frederick W. Clerk Chestnut Hill Reservoir, Metropolitan Water Works, Brighton, Mass.	Jan. 11, 1893
Clark, Harry W. Chemist, Mass. State Board of Health, State House, Boston, Mass.	March 14, 1894
Clark, S. Frederic Water Commissioner, North Billerica, Mass.	March 8, 1899
Clarke, E. W. Asst. Engineer, Rapid Transit R. R. Commission, 13 Astor Place, New York City.	Jan. 10, 1894
Cleveland, W. F. Sewer Commissioner, Brockton, Mass.	June 9, 1892
Cochran, Robert L. Supt. Water Works, Nahant, Mass.	June 16, 1886
Codd, William F. Supt. Wannacomet Water Co., Nantucket, Mass.	June 21, 1885

NAME.	Date of Election
Coffin, Freeman C. Civil and Hydraulic Engineer, 53 State Street, Boston, Mass.	Feb. 13, 1889
Coggeshall, R. C. P. Supt. Water Works, New Bedford, Mass.	June 21, 1882
Cole, D. W. Box 696, Thomaston, Conn.	March 14, 1900
Cole, F. M. Meter Inspector, Brockton Water Works, Brockton, Mass.	Feb. 10, 1897
Collins, Lewis P. Lawrence, Mass.	Dec. 12, 1894
Collins, Michael F. Supt. Water Works, Lawrence, Mass.	Sept. 18, 1901
Colson, Charles D. Water Commissioner, Holyoke, Mass.	March 9, 1898
Connell, Michael A. Supt. Water Works, St. Hyacinthe, P. Q.	Dec. 13, 1893
Cook, Byron I. Woonsocket, R. I.	March 13, 1889
Cook, Henry A. Supt. Water Works, Salem, Mass.	Feb. 10, 1892
Crandall, F. H. Supt. and Treas. Water Works, Burlington, Vt.	June 13, 1888
Crandall, George K. Civil Engineer, New London, Conn.	June 9, 1892
Crawford, J. W. Clerk of Water Board, Lowell, Mass.	June 12, 1896
Croes, J. J. R., C. E. 68 Broad Street, Morris Building, New York City.	June 17, 1887
Crosby, Everett U. 54 William Street, New York City.	March 4, 1900
Crowell, George E. President Water Works, Brattleboro, Vt.	June 15, 1893
Cuddeback, Allan W. Asst. Engineer Passaic Water Co., 109 Washington Street, Paterson, N. J.	Jan. 10, 1900
Curtis, George D. 75 Tonawanda Street, Dorchester, Mass.	Sept. 19, 1900
Cushing, Lucas Box 108, Mansfield, Mass.	Dec. 12, 1888
Daboll, L. E., C. E. New London, Conn.	Jan. 10, 1894
Danforth, John L. Gen. Supt. Spring Water Co., Kane, Pa.	Sept. 10, 1897
Davenport, Dr. B. F. Chairman Water Board, Watertown, Mass.	Feb. 14, 1900
Davis, F. A. W. Vice-Pres. and Treas. Water Co., Indianapolis, Ind.	June 17, 1887
Davis, J. M. Rutland, Vt.	Sept. 13, 1895
Davis, William E. Supt. Water Works, Sherburne, N. Y.	Dec. 11, 1889

NAME.	Date of Election.
Davison, George S. Sec. and Gen. Manager Monongahela Street Railway Co., 512 Smithfield Street, Pittsburg, Pa.	June 15, 1894
Dean, Arthur W. City Engineer, Nashua, N. H.	March 8, 1899
Dean, Francis W. Mechanical Engineer, 53 State Street, Boston, Mass.	June 11, 1890
Dean, Seth, C. E. Glenwood, Iowa.	Dec. 12, 1888
Dean, William H. Water Analyst, Wilkesbarre, Pa.	Sept. 10, 1898
DeBerard, Wilford W. Spring Garden Testing Station, Philadelphia, Pa.	Sept. 19, 1900
Denman, A. N. Des Moines, Iowa.	June 16, 1886
Doane, A. O. Engineering Dept., Metropolitan Water Works, 1 Ashburton Place, Boston, Mass.	Jan. 8, 1896
Doten, Leonard S. Supt. of Construction, Quartermaster Dept. U. S. Army, 170 Summer Street, Boston, Mass.	Jan. 8, 1902
Dotten, William T. Supt. Water Works, Winchester, Mass.	June 21, 1882
Downey, Wm. 49 Wellington Street, Worcester, Mass.	June 14, 1899
Drake, Albert B., C. E. 164 William Street, New Bedford, Mass.	April 21, 1885
Drake, Charles E., C. E. New Bedford, Mass.	Jan. 8, 1890
Drown, Thomas M. President Lehigh University, So. Bethlehem, Pa.	June 13, 1888
Dunbar, E. L. Supt. Water Works, Bay City, Mich.	June 9, 1892
Dwelley, Edwin F. 144 Nahant Street, Lynn, Mass.	Sept. 18, 1901
Dyer, Eben R. Supt. of Distribution, Portland, Me.	June 11, 1890
Eardley, B. A. Supt. Pacific Improvement Co. Water Works, Pacific Grove, Monterey County, Cal.	June 15, 1893
Eddy, Harrison P. Supt. Sewer Department, City Hall, Worcester, Mass.	June 15, 1894
Eglee, Charles H. Hydraulic Engineer, 17 Central Street, Boston, Mass.	June 13, 1889
Eldredge, Edward D. Manager Onset Water Co., 49 Monmouth Street, Brookline, Mass.	Feb. 14, 1900
Ellis, George A. Civil Engineer, 158 Sherman Street, Springfield, Mass.	June 21, 1883
Ellis, John W. Civil Engineer, Woonsocket, R. I.	Dec. 11, 1889
Ellsworth, Emory A. Civil and Hydraulic Engineer, Holyoke, Mass.	June 10, 1896

NAME.	Date of Election.
Esterbrook, Arthur F. Water Commissioner, Leicester, Mass.	Sept. 10, 1897
Evans, George E. Civil Engineer, 95 Milk Street, Boston, Mass.	Feb. 14, 1888
Evans, Myron Edward Civil Engineer, 20 Nassau Street, New York City.	June 13, 1900
Ewing, William B. Civil Engineer, La Grange, Ill.	Dec. 13, 1899
Fairbank, J. H. Chairman Water Commissioners, Winchendon, Mass.	March 11, 1896
Falcon, Joseph G. Submarine Engineer, Evanston, Ill.	June 12, 1901
Fales, Frank L. Asst. Engineer, Engineering Dept., Board of Trustees, Commissioners Water Works, Cincinnati, Ohio.	Dec. 13, 1893
Fanning, John T. Consulting Engineer, Kasota Block, Minneapolis, Minn.	April 21, 1885
Farnham, Elmer E. Supt. Water Works, Box 109, Sharon, Mass.	Dec. 11, 1889
Farnum, Loring N. Civil and Hydraulic Engineer, 53 State Street, Boston, Mass.	Dec. 13, 1893
Fels, August Water Commissioner, Lowell, Mass.	Sept. 13, 1899
Felton, B. R. Civil Engineer, Tremont Building, Boston, Mass.	June 9, 1892
Felton, Charles R. City Engineer, City Hall, Brockton, Mass.	Feb. 16, 1894
Fenn, Charles W., C. E. Manager for Mechanics Falls and North Berwick Water Co., 11 Exchange Street, Portland, Me.	Sept. 18, 1901
Ferguson, John N. Asst. Engineer, Metropolitan Water Works, 1 Ashburton Place, Boston, Mass.	Dec. 14, 1898
Field, Dr. George W. Biological Dept., Massachusetts Institute of Technology, Boston, Mass.	March 13, 1901
Fisher, Edwin A. City Engineer, 16 Reynolds Street, Rochester, N. Y.	Nov. 13, 1901
Fiske, Henry A. 93 Water Street, Boston, Mass.	Sept. 18, 1901
Fitch, Jasper A. Supt. Water Co., Manchester, Conn.	June 12, 1890
FitzGerald, Desmond Engineer Sudbury Dept., Metropolitan Water Works, 1 Ashburton Place, Boston, Mass.	April 21, 1885
Flinn, Richard J., M. E. West Roxbury Station, Boston, Mass.	Sept. 11, 1895
Fobes, A. A. Engineer, Board of Public Works, Pittsfield, Mass.	Feb. 13, 1895
Folwell, A. Prescott Professor of Sanitary and Hydraulic Engineering, Lafayette College, Easton, Pa.	June 15, 1893

NAME.	Date of Election.
Forbes, Fred B. 502 State House, Boston, Mass.	June 14, 1899
Forbes, F. F. Supt. Water Works, Brookline, Mass.	Jan. 29, 1885
Forbes, Murray Manager Westmoreland Water Co., Greensburgh, Pa.	Feb. 11, 1891
Foss, William E. Engineers' Dept., Metropolitan Water Works, 1 Ashburton Place, Boston, Mass.	March 8, 1893
Foster, Joel Supt. Water Works, Montpelier, Vt.	Sept. 13, 1895
Foyé, Andrew E., C. E. Acting Chief Engineer, Dept. of Highways and Viaducts, Greater New York, 11 Broadway, New York City.	Dec. 12, 1894
Freeman, John R. President Factory Insurance Co.'s, 812 Banigan Bldg., Providence, R. I.	Dec. 12, 1888
French, D. W. Supt. Hackensack Water Co., Box 98, Weehawken, N. J.	June 9, 1892
French, Edward V. Insurance Inspector, 31 Milk Street, Boston, Mass.	Sept. 10, 1897
French, Frank Baldwin Engineer and Supt. Board of Public Works, Woburn, Mass.	Sept. 16, 1898
Fteley, Alphonse 14 West 131st Street, New York City.	June 18, 1885
Fuller, Andrew D. 3 Hamilton Place, Boston, Mass.	Dec. 15, 1899
Fuller, Frank E. P. O. Box 775, West Newton, Mass.	March 14, 1900
Fuller, Frank L. Civil Engineer, 12 Pearl Street, Boston, Mass.	June 16, 1886
Fuller, George W. 100 William Street, New York City.	March 8, 1893
Gage, Stephen DeM. Biologist Mass. State Board of Health, Lawrence, Mass.	Jan. 10, 1900
Geer, Harvey M. Civil Engineer, Balston Spa, N. Y.	Sept. 10, 1897
Gerhard, William Paul Civil Engineer and Consulting Engineer for Sanitary Works, 38 Union Square, West, New York City.	Dec. 12, 1888
Gerrish, William B. Supt. and Engineer Water Works, Oberlin, Ohio.	Dec. 14, 1892
Gerry, L. L. Civil Engineer, Stoneham, Mass.	Jan. 29, 1885
Gibbs, Harry F. 106 Pond Street, Natick, Mass.	Jan. 11, 1899
Gilbert, Julius C. Water Registrar and Treas. Water Works, Whitman, Mass.	June 15, 1894
Gilderson, D. H. Supt. Water Works, Haverhill, Mass.	Sept. 11, 1895
Gleason, Fred B. Inspector, Marlboro, Mass.	Sept. 13, 1895

Name.	Date of Election.
Gleason, T. C. Supt. Water Works, Ware, Mass.	June 15, 1894
Glover, Albert S. Tremont Temple Building, Boston, Mass.	June 21, 1882
Goldthwait, W. J. Marblehead, Mass.	June 11, 1890
Goodell, Jerome W. Water Commissioner, Burlington, Vt.	Sept. 18, 1901
Goodell, John Managing Editor "Engineering Record," 100 William Street, New York City.	Sept. 18, 1901
Goodnough, X. H. Engineer State Board of Health, Room 140, State House, Boston, Mass.	Jan. 14, 1891
Gould, Amos A. Water Commissioner, Leicester, Mass.	March 11, 1896
Gould, John A. Chief Engineer, Brookline and Dorchester Gas Light Companies, 1031 Colonial Building, Boylston Street, Boston, Mass.	June 14, 1888
Gow, Frederick W. Supt. Water Works, Medford, Mass.	June 11, 1890
Gowing, E. H., C. E. 12 Pemberton Square, Boston, Mass.	April 21, 1885
Graham, James W. Supt. Meter Dept., Portland Water Co., Portland, Me.	Sept. 13, 1895
Greaney, Thomas F. Water Commissioner, Holyoke, Mass.	March 9, 1898
Greetham, H. W. Local Manager Orlando Water and Sewerage Co., Orlando, Fla.	June 13, 1889
Griffin, J. William Care N. Y. & N. J. Water Co., Arlington, N. J.	Dec. 12, 1900
Groce, William R. Supt. Water Works, Rockland, Mass.	Dec. 12, 1888
Gross, J. F. Inspector Jenkintown Water Co., Jenkintown, Pa.	June 12, 1901
Gubelman, F. J., C. E. 792 Montgomery Street, Jersey City, N. J.	March 11, 1896
Haberstroh, Charles E. Asst. Supt. Metropolitan Water Works, South Framingham, Mass.	Jan. 10, 1900
Hale, Richard A. Principal Assistant Engineer, Essex Co., Lawrence, Mass.	Feb. 14, 1888
Hall, Frank E. 32 Chestnut Street, Quincy, Mass.	June 21, 1882
Hall, Hon. John O. 1230 Hancock Street, Quincy, Mass.	Dec. 12, 1900
Hammatt, E. A. W. Civil Engineer, 53 State Street, Boston, Mass.	June 17, 1887
Hammond, J. C., Jr. Sec'y and Treas., Rockville Water and Aqueduct Co., Rockville, Conn.	Jan. 11, 1888

NAME.	Date of Election.
Hancock, Joseph C. Supt. Water Works, Springfield, Mass.	June 21, 1882
Hapgood, Lyman P. Supt. Athol Water Co., Athol, Mass.	Nov. 14, 1900
Hardy, J. D. Supt. Water Works, Holyoke, Mass.	March 9, 1898
Haring, James S. Civil Engineer, Crafton, Allegheny Co., Pa.	June 9, 1892
Harlow, James H. President Pennsylvania Water Co., Wilkinsburg, Pa. Address Station D, Pittsburg, Pa.	Sept. 10, 1897
Harrington, George W. Wakefield, Mass.	Dec. 10, 1890
Harris, D. A. Supt. Water Works, New Britain, Conn.	March 14, 1888
Hart, Edward W. General Manager Water Works, Council Bluffs, Iowa.	June 10, 1891
Hartwell, David A. City Engineer, Fitchburg, Mass.	Feb. 16, 1894
Hastings, L. M. City Engineer, Cambridge, Mass.	June 13, 1889
Hastings, V. C. Supt. Water Works, Concord, N. H.	June 10, 1886
Hatch, Arthur Elliott Mechanical Engineer, Bay State Dredging Co., 59 High Street, Boston, Mass.	Dec. 11, 1895
Hatch, S. S. Water Commissioner, South Norwalk, Conn.	June 11, 1896
Hathaway, A. R. Water Registrar, Springfield, Mass.	June 10, 1891
Hawes, Louis E. Civil and Hydraulic Engineer, Tremont Building, Boston, Mass.	Dec. 12, 1888
Hawes, William B. Water Commissioner, Fall River, Mass.	June 15, 1894
Hawks, William E. Pres. and Treas. Water Co., Bennington, Vt.	Dec. 12, 1894
Hawley, W. C. Supt. Water Dept., Atlantic City, N. J.	Sept. 8, 1897
Hayes, Ansel G. Asst. Supt. Water Works, Box 323, Middleboro, Mass.	June 13, 1889
Hazard, T. G., Jr. Civil Engineer, Narragansett Pier, R. I.	June 15, 1894
Hazen, Allen Civil Engineer, 220 Broadway, New York City.	June 9, 1892
Heald, Simpson C. Civil Engineer, 48 Congress Street, Boston, Mass.	April 21, 1885
Heermans, Harry C. Supt. Water Works, Corning, N. Y.	June 16, 1886
Hering, Rudolph Hydraulic, Civil, and Sanitary Engineer, 100 William Street, New York City.	June 17, 1887

Name.	Date of Election.
Herschel, Clemens Hydraulic Engineer, 2 Wall Street, Room 68, New York City.	Feb. 10, 1892
Hicks, R. S. 73 Warren Street, New York City.	June 17, 1887
Higgins, James H. Supt. Meter Dept., City Hall, Providence, R. I.	Feb. 8, 1893
Hill, William R. Chief Engineer Croton Aqueduct Commission, 280 Broadway, New York City.	June 9, 1892
Hodgdon, Frank W. Engineer, Mass. Harbor and Land Commission, 131 State House, Boston, Mass.	June 12, 1895
Holden, Horace G. Supt. Pennichuck Water Works, Nashua, N. H.	June 21, 1882
Hollis, Frederick S. Instructor in Chemistry, Yale Medical School, New Haven, Conn.	Dec. 8, 1897
Hook, G. S. Civil Engineer, 705 Union Street, Schenectady, N. Y.	Sept. 13, 1899
Hopkins, Charles C., C. E. Rome, N. Y.	March 10, 1897
Hotchin, George A. Supt. Water Works, Rochester, N. Y.	June 13, 1900
Howard, John L. Division Engineer, Metropolitan Water Works, 1 Ashburton Place, Boston, Mass.	Jan. 10, 1900
Hubbard, Winfred D. Supt. Water Works, Concord, Mass.	Sept. 19, 1900
Hubbell, Clarence W. Water Office, Detroit, Mich.	Sept. 13, 1899
Hughes, V. R., M. E. and E. E. 128 Willow Street, Lansing, Mich.	June 12, 1901
Hunking, Arthur W. 374 Stevens Street, Lowell, Mass.	June 11, 1890
Huntington, James A. Water Registrar, Haverhill, Mass.	Dec. 9, 1891
Jackson, Daniel D. Chemist, Division of Water Supply, Mt. Prospect Laboratory, Brooklyn, N. Y.	March 14, 1894
Jackson, William City Engineer, City Hall, Boston, Mass.	June 11, 1890
Johnson, H. R. Water Commissioner, Reading, Mass.	Dec. 14, 1898
Jones, A. J. New Brunswick, N. J.	Dec. 14, 1887
Jones, James A. Water Registrar, Stoneham, Mass.	March 14, 1894
Jordan, John N. Supt. Water Works, Malden, Mass.	June 12, 1896
Judkins, Fred G. Franklin Falls, N. H.	Feb. 14, 1899

NAME.	Date of Election.
Kay, J. William Supt. Water Works, 75 Congress Street, Milford, Mass.	Jan. 9, 1901
Kent, E. W. Supt. Water Works, Woonsocket, R. I.	Feb. 8, 1893
Kent, Willard Manager Water Co., Narragansett Pier, R. I.	April 21, 1885
Kieran, Patrick Supt. Water Works, Fall River, Mass.	June 16, 1886
Kilbourn, Wm. A. Sec'y (Lancaster) Water Commissioners, South Lancaster, Mass.	Dec. 13, 1899
Killam, James W. Metropolitan Water Works, Reading, Mass.	Dec. 13, 1899
Kimball, Frank C. Supt. Knoxville Water Co., 619 South Gay Street, Knoxville, Tenn.	Feb. 12, 1896
Kimball, George A. Chief Engineer Elevated Lines, Boston Elevated Railway, 101 Milk Street, Boston, Mass.	June 17, 1887
Kingman, Horace Supt. Water Works, Brockton, Mass.	June 15, 1893
Kinnicutt, Leonard P. 77 Elm Street, Worcester, Mass.	Feb. 8, 1893
Knapp, Louis H. Engineer Buffalo Water Works, 280 Linwood Avenue, Buffalo, N. Y.	June 17, 1887
Knight, Charles William, C. E. Rome, N. Y.	March 10, 1897
Knowles, Morris Engineer Filtration Dept., Pittsburg, Pa.	June 12, 1895
Knowlton, Charles F. Commissioner of Public Works, Quincy, Mass.	Sept. 19, 1900
Koch, Harry G. Supt. Castle Creek Water Co., Aspen, Col.	Dec. 11, 1889
Kuehn, Jacob L. Supt. Water Co., York, Pa.	June 9, 1892
Kuichling, Emil Consulting Engineer, Rochester, N. Y.	Sept. 10, 1897
Laforest, J. O. Alfred Chief Engineer Laurentian Water and Power Co., La Presse Building, Montreal, Quebec.	Dec. 14, 1892
Lansing, Edward T. E. Civil Engineer, Little Falls, N. Y.	June 13, 1889
Larned, Edward S. Division Engineer Metropolitan Water Works, South Framingham, Mass.	Jan. 10, 1900
Lautz, Adolphe W. Sec'y Water Co., Pekin, Ill.	Sept. 16, 1898
Lawton, Perry Civil Engineer, Savings Bank Building, Quincy, Mass.	Feb. 16, 1894
Lea, R. S. Asst. Professor of Civil Engineering, McGill University, Montreal, P. Q.	June 15, 1893

NAME.	Date of Election.
Learned, Wilbur F. Civil Engineer, Watertown, Mass.	April 21, 1885
Livermore, N. B. 320 Sansom Street, San Francisco, Cal.	Feb. 14, 1900
Locke, James W. Foreman, Brockton, Mass.	Jan. 9, 1895
Lord, Charles S. Sec'y and Manager Winooski Aqueduct Co., Winooski, Vt.	June 12, 1901
Lord, Harry A. Supt. Water Works, Ogdensburg, N. Y.	Sept. 8, 1897
Loretz, Arthur J. L. Mechanical Engineer, 150 Nassau Street, New York City.	Dec. 9, 1896
Lovell, Thomas C. Supt. Water Works, 104 River Street, Fitchburg, Mass.	June 21, 1882
Loweth, Charles F. 1100 Old Colony Building, Chicago, Ill.	Jan. 9, 1901
Luce, Francis H. Supt. Woodhaven Water Supply Co., Woodhaven, N. Y.	June 12, 1896
Ludlow, J. L. 434 Summit Street, Winston, N. C.	Feb. 14, 1900
Lunt, Cyrus M. Supt. Water Works, Lewiston, Me.	Dec. 9, 1896
Lusk, James L. Major, Corps of Engineers, U. S. A., Washington, D. C.	March 13, 1889
Luther, William J., C. E. Asst. Supt. Attleboro Gas Light Co., Attleboro, Mass.	June 15, 1893
McCarthy, Daniel B. Supt. Water Works Co., Waterford, N. Y.	Sept. 11, 1895
McClintock, W. E. Member of Massachusetts Highway Commission, 15 Court Square, Boston, Mass.	June 17, 1887
McClure, Frederick A. City Engineer, Worcester, Mass.	June 15, 1894
McConnell, B. D. Civil Engineer, 185 St. James Street, Montreal, P. Q.	June 12, 1890
McInnes, Frank A. Asst. Engineer Boston Water Works, 23 Salcombe Street, Dorchester, Mass.	Sept. 18, 1901
McIntosh, H. M. City Engineer, Burlington, Vt.	Sept. 11, 1895
McKenzie, Theodore H. Manager Water Works, Southington, Conn.	June 12, 1890
McKenzie, Thomas Supt. Water Works, Box 712, Westerly, R. I.	Dec. 12, 1894
MacLean, Thomas A. Charlottetown, P. E. I., Canada.	Jan. 8, 1902
McMillen, Norman A. Supt. Water Works, North Billerica, Mass.	June 13, 1900
MacMurray, J. C. 33 Oak Ave., Worcester, Mass.	Dec. 9, 1896

NAME.	Date of Election
Mann, Thomas W. Civil Engineer, Holyoke, Mass.	June 9, 1892
Manning, George E. Civil Engineer, New London, Conn.	March 9, 1898
Marble, Arthur D. City Engineer, Lawrence, Mass.	Feb. 12, 1896
Marion, J. A. Civil Engineer, New York Life Building, Montreal, P. Q.	Dec. 13, 1893
Martin, A. E. Supt. Water Company, South Framingham, Mass.	April 21, 1885
Martin, Cyrus B. Treas. Water Co., Norwich, N. Y.	June 17, 1887
Marvell, Edward I. Civil Engineer, 81 Bedford Street, Fall River, Mass.	Jan. 13, 1897
Mason, William P. Professor of Chemistry, Rensselaer Polytechnic Institute, Troy, N. Y.	Dec. 11, 1895
Mather, Nelson E. Supt. Water Works, Clinton, Mass.	Sept. 19, 1900
Mattice, Asa M. Chief Engineer Westinghouse Electric and Manufacturing Co., East Pittsburg, Pa.	June 15, 1894
Maybury, William E. Supt. Water Works, Braintree, Mass.	Jan. 9, 1901
Maxcy, Josiah S. Treas. Madison Water Co., Gardiner, Me.	Dec. 14, 1887
Mead, Daniel W. Consulting Engineer, 605 First National Bank Building, Chicago, Ill.	Sept. 19, 1900
Merrill, Frank E. Water Commissioner and Supt. Water Works, Somerville, Mass.	Dec. 9, 1896
Merritt, D. S. Engineer and Supt. Water Works, Tarrytown, N. Y.	Dec. 13, 1893
Metcalf, Leonard Civil Engineer, 14 Beacon Street, Boston, Mass.	Feb. 10, 1897
Metcalfe, Henry President Water Board, Cold Spring, N. Y.	June 10, 1896
Miller, A. M. Lieut.-Col. Corps of Engineers, U. S. A., 2728 Pennsylvania Avenue, Washington, D. C.	Nov. 14, 1900
Miller, Hiram A. Clinton, Mass.	March 13, 1901
Miller, John F. Asst. Sec'y Westinghouse Air Brake Co., East Pittsburg, Pa.	June 10, 1896
Miller, P. Schuyler 108 Park Place, Brooklyn, N. Y.	Jan. 10, 1900
Mills, Frank H. City Engineer, Woonsocket, R. I.	Jan. 14, 1891
Mirick, George Langdon Civil Engineer, 104 Porter Street, Malden, Mass.	June 15, 1893

NAME.	Date of Election.
Mixer, Charles A. Resident Engineer, Rumford Falls Light and Water Co., Rumford Falls, Me.	Sept. 18, 1901
Moat, C. P. Burlington, Vt.	March 13, 1901
Molis, William Supt. Water Works Co., Muscatine, Iowa.	June 17, 1887
Moran, John W. Supt. Water Works, Gloucester, Mass.	March 13, 1901
Mullhall, John F. J. Treas. Portland (Conn.) Water Co., 11 Beacon Street, Boston, Mass.	Nov. 14, 1900
Murdoch, William Supt. Water Works, St. John, N. B.	Jan. 10, 1900
Myers, J. H., Jr. Asst. Engineer N. Y. Rapid Transit R. R. Commission, 1261 Clover Street, Bronx, New York City.	Sept. 11, 1895
Nash, George D. Supt. Winooski Aqueduct Co., Winooski, Vt.	March 13, 1901
Nash, H. A., Jr. Civil Engineer, Weymouth Heights, Mass.	March 13, 1895
Naylor, Thomas Maynard, Mass.	Feb. 16, 1894
Nettleton, Charles H. Treas. and Supt. Water Co., Birmingham, Conn.	June 16, 1886
Newhall, John B. 184 Bay Street, Stapleton, Staten Island, N. Y.	Dec. 14, 1892
Nichols, Thomas P. Member Water Board, 11 Prospect Street, Lynn, Mass.	Jan. 10, 1894
Northrop, Frank L. P. O. Box 1566, Saco, Me.	June 15, 1893
Nuebling, Emil L. Engineer and Supt. Water Dept., Reading, Pa.	Feb. 12, 1896
Nye, George H. Civil Engineer, New Bedford, Mass.	March 11, 1891
Nye, Joseph K. President Water Company, Fairhaven, Mass.	March 8, 1893
O'Connell, P. D. Supt. Water Works, Somersworth, N. H.	Sept. 16, 1898
Paine, C. W. Constructing Engineer on Extension of Butte City Water Works, Lewisohn Building, Butte, Mont.	Dec. 12, 1888
Parker, Charles B. Asst. Supt. Water Works, Cambridge, Mass.	Jan. 9, 1901
Parker, Horatio N. 456 Bloomfield Avenue, Montclair, N. J.	March 10, 1897
Parks, Charles F. Civil Engineer, 11 Beacon Street, Boston, Mass.	Dec. 11, 1889
Patch, Walter Woodbury Civil Engineer, Eastern Avenue, South Framingham, Mass.	June 12, 1895
Paulison, Washington Supt. Acquackanonk Water Co., Passaic, N. J.	Sept. 16, 1898

NAME.	Date of Election.
Payson, E. R. Sec'y Portland Water Co., Portland, Me.	June 13, 1900
Pease, A. G. Water Commissioner, Spencer, Mass.	June 16, 1886
Peene, Edward L. Supt. Water Works, Yonkers, N. Y.	Sept. 16, 1898
Peirce, Charles E. Supt. East Providence Water Co., East Providence Centre, R. I.	Sept. 14, 1887
Perkins, John H. Supt. Watertown and Belmont Water Works, Watertown, Mass.	June 16, 1886
Phillips, Edward Civil Engineer, 11 Broadway, New York City.	Dec. 8, 1897
Pierce, Frank L. 464 Elm Street, Richmond Hill, Queens County, N. Y.	Dec. 14, 1898
Pitcher, Frank H. Chief Engineer Montreal Water and Power Co., 62 Imperial Building, St. James Street, Montreal, P. Q.	June 12, 1901
Pitman, Winthrop M. Treas. North Conway Water and Improvement Co. Address, 493 Centre Street, Jamaica Plain, Mass.	June 17, 1887
Pitney, Frederic V. Engineer Morristown Aqueduct Co., Morristown, N. J.	Feb. 16, 1894
Pollard, William D. General Manager Water Co., Pottsville, Pa.	June 10, 1891
Pope, Macy S. 31 Milk Street, Boston, Mass.	March 13, 1901
Porter, Dwight Professor of Hydraulic Engineering, Massachusetts Institute of Technology, Boston, Mass.	March 13, 1889
Potter, Alexander Civil and Sanitary Engineer, 137 Broadway, New York City.	March 14, 1894
Probst, C. O. Secretary State Board of Health, Columbus, Ohio.	Dec. 8, 1897
Putnam, J. B. Supt. Westboro Water and Sewer Depts., Westboro, Mass.	Sept. 10, 1897
Reynolds, E. H. Brockton, Mass.	June 9, 1892
Rice, George S. Deputy Chief Engineer, Rapid Transit Railroad Commissioners, 320 Broadway, New York City.	Dec. 14, 1892
Rice, James L. Supt. Water Co., Claremont, N. H.	June 15, 1894
Rice, L. Frederick Architect and Civil Engineer, 125 Milk Street, Boston, Mass.	June 17, 1887
Richards, Walter H. Supt. Water Works, New London, Conn.	Oct. 11, 1882
Richardson, T. F. Dept. Engineer Metropolitan Water Works, Clinton, Mass.	Feb. 10, 1897
Ridpath, J. W. Secretary and Manager Water Co., Jenkintown, Pa.	June 9, 1892

NAME.	Date of Election.
Riley, Charles E. Member Water Board, Brookline, Mass.	Sept. 13, 1899
Robbins, F. H. Civil Engineer, 1 Ashburton Place, Boston, Mass.	Sept. 10, 1897
Robertson, George H. Supt. Water Works, Yarmouth, N. S.	June 9, 1892
Robertson, W. W. Water Registrar, Fall River, Mass.	June 17, 1887
Robinson, A. Supt. Water Works, Benicia, Cal.	June 11, 1896
Roden, Thomas Supt. Water Works, Arlington, Mass.	June 12, 1896
Rogers, Thomas H. Pumping Engineer, Pennichuck Water Works, Nashua, N. H.	Sept. 8, 1897
Rotch, William Civil Engineer, Room 742, Exchange Building, 53 State Street, Boston, Mass.	June 16, 1886
Roullier, G. A. Supt. Water Works, Flushing, N. Y.	June 13, 1889
Royce, Harley E. Asst. Engineer, Brookline, Mass.	Jan. 9, 1895
Russell, A. N. President Water Commissioners, Illion, N. Y.	Sept. 13, 1899
Sando, W. J. Manager Water Works Dept., International Steam Pump Co., Brooklyn, N. Y.	June 12, 1895
Saville, Caleb M. Engineering Dept., Metropolitan Water Works, 1 Ashburton Place, Boston, Mass.	March 8, 1893
Scott, Walter M. Resident Engineer Chatham Water Works and Sewerage System, Chatham, N. B.	Nov. 13, 1901
Sears, Walter H. 220 Sandwich Street, Plymouth, Mass.	Sept. 13, 1899
Sealy, W. F. P. Supt. Water Works, Potsdam, N. Y.	Sept. 13, 1895
Sedgwick, William T. Professor of Biology, Massachusetts Institute of Technology, Boston, Mass.	Feb. 12, 1890
Sharples, Philip P. 22 Concord Avenue, Cambridge, Mass.	June 14, 1899
Shedd, Edward M. Inspector Water Works, Somerville, Mass.	Jan. 9, 1901
Shedd, Edward W. Civil Engineer, 146 Westminster Street, Providence, R. I.	March 9, 1892
Shedd, J. Herbert Consulting Engineer, Providence, R. I.	June 13, 1888
Sherman, Charles W. Civil Engineer, Assistant Engineer Metropolitan Water Works, 1 Ashburton Place, Boston, Mass.	Sept. 10, 1897
Sherman, William B. Mechanical Engineer, Box 974, Providence, R. I.	Oct. 11, 1882

NAME.	Date of Election.
Sherrerd, Morris R. Engineer Water Dept., Newark, N. J.	*March 10, 1897*
Shippee, John D. Holliston, Mass.	Jan. 14, 1891
Shirreffs, Reuben Chief Engineer Virginia Electric Railway and Development Co., Richmond, Va.	March 12, 1890
Sinclair, Melville A. Supt. Water Works, Bangor, Me.	June 15, 1894
Smith, Herbert E. Professor of Chemistry, Yale Medical School; Chemist Connecticut State Board of Health. Address, 430 George Street, New Haven, Conn.	Dec. 14, 1892
Smith, H. O. Water Commissioner, Leicester, Mass.	June 15, 1894
Smith, John E. Supt. Water Works, Andover, Mass.	June 10, 1896
Smith, J. J. City Engineer, Grand Forks, N. D.	Nov. 14, 1900
Smith, J. Waldo Supt. Passaic Water Co., 109 Washington Street, Paterson, N. J.	Dec. 13, 1893
Smith, Sidney Civil Engineer, 91 Maple Street, West Roxbury, Mass.	June 12, 1895
Smith, Solon F. Supt. and Treas. Water Co., Grafton, Mass.	June 17, 1887
Snell, George H. Water Commissioner and Supt. Water Works, Attleboro, Mass.	Dec. 12, 1900
Soper, George A. 29 Broadway, New York City.	Jan. 12, 1898
Souther, Henry Water Commissioner, Hartford, Conn.	June 13, 1900
Sparks, H. T. Supt. Water Dept., Public Works Co., Bangor, Me. Address, Box 208, Brewer, Me.	June 15, 1894
Spooner, Herman W. Engineer Gloucester Water Works, 28 Granite Street, Gloucester, Mass.	Nov. 13, 1901
Sprenkel, John F. General Manager York Water Co., York, Pa.	June 12, 1901
Springfield, John F. Civil Engineer, 64 Summer Street, Rochester, N. H.	Jan. 13, 1892
Stacy, George A. Supt. Water Works, Marlboro, Mass.	April 21, 1885
Stearns, Frederic P. Chief Engineer Metropolitan Water and Sewerage Board, 1 Ashburton Place, Boston, Mass.	June 17, 1887
Stevens, James T. Chairman Board of Water Commissioners, South Braintree, Mass.	Jan. 8, 1902
Stevenson, Harry W. Nadine, Allegheny Co., Pa.	Sept. 21, 1900

NAME.	Date of Election.
St. Louis, J. A. Water Registrar, Marlboro, Mass.	Sept. 10, 1897
Stone, Dr. B. H. Burlington, Vt.	March 13, 1901
Stone, Charles A. Electrical Engineer, 93 Federal Street, Boston, Mass.	June 15, 1894
Street, L. Lee 27 Pearl Street, Dorchester, Mass.	Jan. 10, 1900
Sullivan, John C. Holyoke, Mass.	June 15, 1893
Sullivan, J. J. Water Commissioner, Holyoke, Mass.	March 9, 1898
Sullivan, William F. City Engineer's office, Lowell, Mass.	Feb. 14, 1900
Swain, George F. Professor of Civil Engineering, Massachusetts Institute of Technology, Boston, Mass.	June 17, 1887
Swan, Joseph W. Asst. Clerk, Water Commissioner's office, Boston, Mass.	Feb. 11, 1891
Taber, Robert W. Water Commissioner, New Bedford, Mass.	Sept. 16, 1898
Taylor, Charles N. Contracting Engineer, Wellesley, Mass.	Feb. 13, 1901
Taylor, Edwin A. Constructing Engineer, 73 Tremont Street, Boston, Mass.	Dec. 14, 1892
Taylor, Frederick L. Engineer, Brookline Water Works, Brookline, Mass.	Feb. 13, 1895
Taylor, Lucian A. Civil Engineer and Contractor, 73 Tremont Street, Boston, Mass.	June 19, 1884
Tenney, D. W. Methuen, Mass.	June 10, 1896
Tenney, Joseph G. Treas. and Supt. Water Works, Leominster, Mass.	June 21, 1882
Thomas, Robert J. Supt. Water Works, Lowell, Mass.	June 9, 1892
Thomas, Harry L. Asst. Supt. Water Co., Hingham, Mass.	Dec. 14, 1898
Thomas, William H. Supt. Water Co., Hingham, Mass.	Dec. 14, 1887
Thomson, John Hydraulic Engineer, 253 Broadway, New York City.	June 9, 1892
Tighe, James L. Engineer Water Works, Holyoke, Mass.	March 9, 1898
Tingley, R. H. Civil Engineer, 75 Westminster Street, Providence, R. I.	Feb. 8, 1893
Tinkham, S. Everett Asst. Engineer, Engineering Dept., City Hall, Boston, Mass.	Jan. 14, 1891
Tompkins, Charles H. Civil Engineer, 120 Liberty Street, New York City.	Dec. 11, 1889

Name.	Date of Election.
Tower, D. N. Supt. Water Co., Cohasset, Mass.	June 17, 1887
Travis, George W. Supt. Water Works, Natick, Mass.	Dec. 13, 1899
Treman, E. M. Supt. and Sec'y, Water Co., Ithaca, N. Y.	June 11, 1890
Tribus, Louis L. Consulting Civil and Hydraulic Engineer, 84 Warren Street, New York City.	March 11, 1896
Tubbs, J. Nelson General Inspector, Dept. of Public Works, State of New York, 207 Wilder Building, Rochester, N. Y.	June 11, 1890
Turner, H. N. Manager Water Co., St. Johnsbury, Vt.	Dec. 11, 1895
Tuttle, Arthur S. Civil Engineer, Department Water Supply, 82d Street, near 11th Avenue, Brooklyn, N. Y.	March 14, 1894
Vallaincourt, J. A. Asst. Treas. Water Co., Berlin, N. H.	Sept. 13, 1899
Vaughn, W. H. Supt. Water Works, Wellesley Hills, Mass.	Dec. 11, 1889
Venner, John Chief Inspector Bureau of Water, Syracuse, N. Y.	Jan. 11, 1899
Wade, William W. Water Registrar, Woburn, Mass.	Dec. 8, 1897
Walker, Charles K. Supt. Water Works, Manchester, N. H.	June 21, 1882
Walker, John Civil Engineer, Newmarket, N. H.	Dec. 12, 1894
Wallace, E. L. Supt. Water Works, Franklin Falls, N. H.	Dec. 14, 1892
Warde, Charles S. Cashier Staten Island Water Supply Co., West New Brighton, Staten Island, N. Y.	Sept. 18, 1901
Warde, John S. Supt. Staten Island Water Supply Co., West New Brighton, Staten Island, N. Y.	June 15, 1894
Warren, H. A. Supt. Water Works, St. Albans, Vt.	Dec. 14, 1892
Webster, F. P. Supt. Water Works Co., Lakeport, N. H.	Jan. 8, 1890
Wegmann, E. Division Engineer on construction of new Croton Reservoirs, Katonah, N. Y.	June 12, 1901
Wescott, George P. Treas. Portland Water Co., Portland, Me.	June 16, 1886
West, George F. Manager Water Works, Union Mutual Building, Portland, Me.	Nov. 13, 1901
Weston, Robert S. Chemist and Bacteriologist, 14 Beacon Street, Boston, Mass.	Sept. 8, 1897
Wheeler, Elbert Treas. Water Co., 14 Beacon Street, Boston, Mass.	Dec. 9, 1891

NAME.	Date of Election.
Wheeler, William Civil Engineer, 14 Beacon Street, Boston, Mass.	Dec. 11, 1889
Whipple, George C. Mt. Prospect Laboratory, Flatbush Avenue and Eastern Parkway, Brooklyn, N. Y.	Feb. 8, 1893
Whitcomb, W. H. President Water Co., Norway, Me.	June 16, 1886
Whitham, Jay M. Mechanical Engineer, 607 Bullitt Building, Philadelphia, Pa.	Dec. 13, 1893
Whitman, Herbert T. Civil Engineer, 85 Devonshire Street, Boston, Mass.	Feb. 8, 1893
Whitney, John C. Water Commissioner, Newton, Mass.	June 17, 1887
Whittemore, W. P. Supt. Electric Light and Water Depts., North Attleboro, Mass.	June 16, 1886
Wigal, James P. Henderson, Ky.	June 16, 1886
Wilde, George E. Asst. Supt. Metropolitan Water Works, Medford, Mass.	June 16, 1886
Wilder, Frederick W. Treas. Aqueduct Co., Woodstock, Vt.	Dec. 12, 1888
Wilkins, Frank B. Supt. Water Works, Milford, N. H.	Feb. 14, 1900
Williams, Gardner S. Engineer in charge of Hydraulic Laboratory, and Professor of Experimental Hydraulics, Cornell University, Ithaca, N. Y.	June 12, 1895
Williams, William F. City Engineer, New Bedford, Mass.	Feb. 16, 1894
Winslow, C.-E. A. Massachusetts Institute of Technology, Boston, Mass.	Sept. 21, 1900
Winslow, Frederic I. Asst. Engineer, City Engineer's office, City Hall, Boston, Mass.	Jan. 13, 1892
Winslow, George E. Waltham, Mass.	June 18, 1885
Winslow, S. J. Supt. Water Co., Pittsfield, N. H.	June 17, 1887
Wiswall, E. T. West Newton, Mass.	June 13, 1889
Wood, Henry B. Harbor and Land Commission, State House, Boston, Mass.	Dec. 13, 1893
Woodruff, Timothy Supt. Water Works, Bridgeton, N. J.	June 13, 1888
Woods, Henry D. West Newton, Mass.	Jan. 9, 1895
Woods, L. R. Supt. Water Dept., 206 Vine Street, Everett, Mass.	Sept. 18, 1901
Worthington, E., Jr. Civil Engineer, Dedham, Mass.	Jan. 11, 1893
Wright, George W. Chief Engineer, Water Dept., Box 426, Norfolk, Va.	June 9, 1892

NAME. Date of Election.

Yorston, W. G. — Dec. 14, 1892
Constructing Engineer, Box 470, Truro, N. S.

Youngren, Carl J. — Dec. 13, 1899
Boston Water Dept., City Hall, Boston, Mass.

Zick, W. G. — June 15, 1893
253 Broadway, New York City.

HONORARY MEMBERS.

Frost, George H. — June 16, 1886
President Engineering News Pub. Co., St. Paul Building, New York City.

Gale, James M. — Jan. 16, 1889
Engineer-in-Chief Loch Katrine Water Works, Glasgow, Scotland.

Meyer, Henry C. — June 17, 1887
The Engineering Record, 100 William Street, New York City.

Shepperd, F. W. — Feb. 12, 1890
"Fire and Water," Bennett Building, Nassau and Fulton streets, New York City.

ASSOCIATES.

Allis-Chalmers Co. — Dec. 13, 1893
"High Duty Pumping Engines," Milwaukee, Wis.

Ashton Valve Co. — June 18, 1885
"Water Relief Valves," 271 Franklin Street, Boston, Mass.

Barr Pumping Engine Co. — Feb. 13, 1901
Philadelphia, Pa.

Harold L. Bond & Co. — Dec. 12, 1900
"Construction Work Supplies," 140 Pearl Street, Boston, Mass.

Brandt, Randolph — April 21, 1885
"Selden Patent Packing," 38 Cortlandt Street, New York City.

Brewster, H. M. (E. Stebbens Mfg. Co.) — June 13, 1888
"Brass Goods," Brightwood P. O., Springfield, Mass.

Builders Iron Foundry — June 17, 1887
P. O. Box 218, Providence, R. I.

J. B. Campbell Brass Works — Sept. 18, 1901
16th and Cascade streets, Erie, Pa.

Chadwick-Boston Lead Co. — April 21, 1885
162 Congress and 180–182 Franklin streets, Boston, Mass.

Chapman Valve Mfg. Co. — June 21, 1883
"Valves and Hydrants," Indian Orchard, Mass.

Charles A. Claflin & Co. — Jan. 9, 1901
"Steam Engineering and Water Works Supplies," 188 Franklin Street, Boston, Mass.

Coffin Valve Co. — June 16, 1886
"Valves and Hydrants," Neponset, Boston, Mass.

Deane Steam Pump Co. — April 21, 1885
"Steam Pumps and Pumping Machinery," Holyoke, Mass.

Dibble, F. J. — June 11, 1890
"Electric Gages," Peabody, Mass.

NAME.	Date of Election.
Drummond, M. J. "Cast Iron Pipe," 192 Broadway, Corbin Building, New York City.	Dec. 14, 1887
Dunne, George C. Manager Portland Stoneware Co., 42 Oliver Street, Boston, Mass.	Feb. 10, 1892
Eagle Oil and Supply Co. 104 Broad Street, Boston, Mass.	June 15, 1894
Garlock Packing Co. "Packing," 12 Pearl Street, Boston, Mass.	June 11, 1896
William H. Gallison Co. "Engineer's Supplies, Pipe, etc.," 36 Oliver Street, Boston, Mass.	June 18, 1885
Gilchrist, George E. "Pipes and Fittings," 106 High Street, corner Congress Street, Boston, Mass.	Jan. 11, 1888
The Goulds Mfg. Co. "Engines," 236 Congress Street, Boston, Mass.	Sept. 11, 1895
Hersey Mfg. Co. "Meters," South Boston, Mass.	June 16, 1886
International Steam Pump Co. P. O. Box 14, Brooklyn, N. Y.	June 12, 1901
Jenks, Henry F. "Drinking Fountains," Pawtucket, R. I.	April 21, 1885
Kennedy Valve Co. "Valves, Hydrants, and Indicating Devices," 57 Beekman and 87 Ann streets, New York City.	Sept. 8, 1897
Lamb & Ritchie "Tin-lined Iron Pipe and Lead-lined Iron Pipe," Cambridge, Mass.	Dec. 12, 1900
Lead Lined Iron Pipe Co. "Lead and Tin Lined Pipe," Wakefield, Mass.	Sept. 8, 1897
Libbey, Parker & Co. "Plumbing, Steam, Water Works Specialties and Supplies," 416 Atlantic Avenue, Boston, Mass.	March 14, 1900
Ludlow Valve Mfg. Co. "Valves and Hydrants," 150 High Street, Boston, Mass.	June 18, 1885
Lynch, John E. Proprietor "E. Hodge & Co., Stand Pipes," East Boston, Mass.	June 10, 1891
Montreal Pipe Foundry Co., Lt'd Acadia Mines, Londonderry, N. S.	Jan. 8, 1902
Moore, Charles A. "Engines, Boilers, and Supplies," 85 Liberty Street, New York City.	Dec. 9, 1896
I. P. Morris Co. "Pumping Engines and Turbines," corner Beach and Ball streets, Philadelphia, Pa.	June 15, 1894
H. Mueller Mfg. Co. "Water Works Supplies," Decatur, Ill.	Sept. 11, 1895
National Lead Co. (Boston Branch) 89 State Street, Boston, Mass.	March 14, 1894

NAME.	Date of Election.
National Meter Co. "Meters," 84 Chambers Street, New York City.	Oct. 11, 1882
National Tube Co. "Pipe and Fittings," McKeesport, Pa. Address, 95 Milk Street, Boston, Mass.	April 21, 1885
Neptune Meter Co. "Trident Water Meters," Jackson Avenue and Crane Street, Long Island City, N. Y.	June 15, 1893
New York Continental Jewell Filtration Co. "Filters," 15 Broad Street, New York City.	June 15, 1894
Norwood Engineering Co. "Hydrants, Filters, etc." Florence, Mass.	April 21, 1885
Peck Bros. & Co. "Water Works Supplies," 65 Oliver Street, Boston, Mass.	Dec. 12, 1894
Perrin, Seamans & Co. "Construction Tools and Supplies," 57 Oliver Street, Boston, Mass.	June 11, 1890
Pittsburg Meter Co. "Water Meters," East Pittsburg, Pa.	June 15, 1894
Rensselaer Mfg. Co. "Valves and Water Gates, and Sole Manufacturers of Corey Fire Hydrant," Troy, N. Y.	June 11, 1890
Roberts, C. E. Hartford Steam Boiler Inspection and Insurance Co., 125 Milk Street, Telephone Building, Boston, Mass.	March 13, 1889
Robinson, Edward "Wells Light Mfg. Co.," 44-46 Washington Street, New York City.	Dec. 13, 1899
Ross Valve Co. "Valves," Troy, N. Y.	June 13, 1888
Sampson, George H. "Powder," 13 Pearl Street, Boston, Mass.	June 18, 1885
A. P. Smith Mfg. Co. "Tapping Machines," Passaic Avenue, foot of Brill Street, Newark, N. J.	Feb. 10, 1892
B. F. Smith & Bro. "Artesian and Driven Wells," 38 Oliver Street, Boston, Mass.	Sept. 10, 1897
Sumner & Goodwin Co. "Water Works Supplies," 287 Congress Street, Boston, Mass.	April 21, 1885
Sweet & Doyle Selling Agents Vincent Valves, Cohoes, N. Y.	June 13, 1900
Thomson Meter Co. "Water Meters," 79 Washington Street, Brooklyn, N. Y.	June 13, 1888
Union Water Meter Co. "Water Meters," 31 Hermon Street, Worcester, Mass.	June 21, 1883
United States Cast Iron Pipe and Foundry Co. Corner Broad and Chestnut streets, Philadelphia, Pa.	Sept. 13, 1899
Waldo Bros. "Contractors' Supplies," 102 Milk Street, Boston, Mass.	April 21, 1885
Walworth Mfg. Co. "Pipe, Brass Work, Service Boxes, etc.," 134 Federal Street, Boston, Mass.	April 21, 1885

NAME.	Date of Election.
R. D. Wood & Co. "Cast Iron Pipe," 400 Chestnut Street, Philadelphia, Pa.	June 19, 1884
The George Woodman Co. "Pipe and Fittings," 41 Pearl Street, Boston, Mass. P. O. Box 3653.	April 21, 1885

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CALIFORNIA. *Benicia* — A. Robinson. *Los Angeles* — E. M. Boggs. *Pacific Grove* — B. A. Eardley. *San Francisco* — N. B. Livermore.

BRITISH AMERICA.

NOVA SCOTIA. *Dartmouth* — W. L Bishop. *Truro* — W. S. Yorston. *Yarmouth* — G. H. Robertson.

PRINCE EDWARD ISLAND. *Charlottetown* — T. A. MacLean, W. M. Scott

NEW BRUNSWICK. *St. John* — W. Murdoch.

PROVINCE OF QUEBEC. *Montreal* — J. O. A. LaForest, R. S. Lea, J. A. Marion, B. D. McConnell, F. H. Pitcher. *St. Hyacinthe* — M. A. Connell.

PROVINCE OF ONTARIO. *Toronto* — J. A. Amyot.

BRITISH SOUTH AFRICA. *Cape Town* — S. G. Armstrong.

SOUTH AMERICA.

ARGENTINA. *Buenos Aires* — Charles Anthony, Jr.

THE DRAINAGE OF SWAMPS FOR WATERSHED IMPROVEMENT.

BY EDWARD S. LARNED, DIVISION ENGINEER, METROPOLITAN WATER WORKS, SOUTH FRAMINGHAM, MASS.

[*Presented December 11, 1901.*]

In the development of the water supply of Boston and the Metropolitan District, the aim has been to provide not only an abundant supply, but a quality of water wholesome and attractive in appearance and taste. Great care and much expense have been devoted to the preparation of storage reservoir sites, in the removal of soil and organic matter, providing against shallow flowage, and keeping the watersheds free from contamination by sewage or other waste products of human life and industry.

The quality and appearance of all surface waters, such as ponds, lakes, rivers, and brooks, are affected by the physical characteristics of the areas drained, and when a watershed contains many swamps, it is known that the effluent streams will contain a large amount of dissolved organic matter, giving the water a deep color and furnishing food products for organisms that under certain conditions will impart a most unpleasant odor and taste to the water in the storage reservoirs.

While it is generally supposed that water unpleasant to the sight, taste, and smell from such causes is innocuous, we have it on good medical authority that it superinduces bowel complaints, zymotic troubles, dysentery, and low fevers.

In the case of an unpolluted dark surface water, the color is generally indicative of the amount and condition of the organic matter present, and any improvement tending to reduce the color will prove of value not alone from the æsthetic view, improving the appearance of the water, but, by a corresponding reduction in the supply of nitrogenous food for animal and vegetable organisms, tends to remove one of the most important factors in producing bad tastes and odors in the water of storage reservoirs.

In a large reservoir suitably prepared by the removal of all soil and vegetable matter, a marked reduction of color will be noted in

water not changed oftener than once in eight months, and if allowed to remain in storage for a year or more, it will become practically colorless. This fact is established under the investigations of the Massachusetts State Board of Health, and a very instructive discussion of the subject is found in the special report of this board, on Examinations of Water Supplies, for the year 1890, by Dr. Thomas M. Drown, chemist of the board.

Ideal conditions of storage and watershed are seldom attainable, and it follows that the purer a water can be delivered to the storage reservoir, assuming the latter to be properly cleaned out, the less the chance of deterioration and the more wholesome and acceptable it will be to the consumer.

SWAMP DRAINS.

In the Sudbury watershed the many swamps existing along the brooks tributary to Framingham Reservoir No. 3, the new Sudbury Reservoir, and the open channel at the lower end of the Wachusett Aqueduct, which flows into the Sudbury Reservoir, made it seem expedient to construct a system of ditches to intercept or facilitate the passage of water from the uplands through or around the swamps. The latter are generally very nearly level, without well-defined water courses, and such as are found are badly congested with rank vegetation and rotting wood; soundings find the mud or peat deposit from one foot to more than thirty feet in depth. Most of the swamps are timbered, the growth being maple, pine, alder, birch, chestnut, elm, dogwood, and cedar, with often a rank undergrowth, and it is to be expected that water held in check or passing slowly through such a place would acquire a high color. Figs. 1 and 2, Plate I, show conditions characteristic of the swamps.

In order to properly locate and determine the capacity of the ditch required, a survey is made showing the outlines of the swamp; soundings and surface elevations are taken from the edge of the swamp out to a point beyond the probable location of the ditch, with an occasional cross section over the full width of the swamp; influent brooks are noted; the limits of timber and open land located; r . perty lines taken, and a reconnoisance of the limits of the waters..ed above the point of the proposed improvement is made. A paper or plan location is made, the line run out on the ground and adjusted, if necessary, to escape bowlders or other difficulties not indicated in the preliminary survey.

When the swamp is long and narrow, a single ditch suffices, located on the side from which the larger yield is received; the influent brooks, if any, on the opposite side of the swamp are to be led by cross drains into the main ditch.

In the case of a more extensive swamp, the drains are constructed on the edge surrounding it, thus intercepting the entire upland yield, and carrying the water by, before it comes in contact with any part of the swamp; and with the bottom of the ditches usually below the peat formation, in sand or gravel, it follows that more or less ground water is also cut off from the swamp, and the latter soon becomes moderately dry and capable of producing a good quality of grass if cultivated; this further improvement is encouraged among the land owners, particularly in the case of abandoned or neglected meadows, and the opportunity thus afforded by adequate drainage to reclaim land has been an important factor in securing ditching rights through private land without payment therefor. In this connection it may be stated that all of the improvement effected under supervision of the writer was through private land; 47 411 feet of improved ditches were constructed, passing through or affecting twenty-seven separate estates, and the necessary rights were secured at a total expenditure for damages, real or fancied, of $49.82.

In negotiating with the land owner, the nature and extent of the proposed improvement were explained in detail; the benefits to be derived by both parties to the agreement pointed out; ample time for consideration was given, and oftentimes several interviews were necessary; it is not uncommon to find men loth to grant any privilege to a municipality or commonwealth without a money consideration, though they suffer no loss or damage and even derive a benefit thereby. Upon securing consent, the following simple form was filled out and signed: —

I, (John Brown,) of Southboro, Mass., hereby consent that the Metropolitan Water Board may, without charge, dig and maintain channels for the drainage of my low land in Southboro, substantially on lines shown on a plan hereto annexed, entitled, "DRAINAGE OF SWAMPS," "ANGELICO BROOK," dated May, 1900.

The earth removed from such new channels shall be neatly leveled off or used in filling the channels of existing brooks wherever I may permit such filling.

(Four) (4) bridges shall be built in a substantial manner across said channels at points to be designated by me.

FIG. 1. — WOODED SWAMP.

FIG. 2. — OUTLET OF SWAMP IN BOWLDER GROUND.

(Two) (2) watering places shall be provided at points to be designated by me.

Said board shall have the right to cut and remove all wood and timber on land owned by me within twenty feet from the center and on each side of said drain, and agrees as part consideration for this agreement to haul to hard land and cord up all wood cut on said lands under the provisions of this agreement, or shall leave the same in the log if so directed.

In consideration of the benefits to be derived by me from the foregoing arrangement, I agree without further consideration, etc.

(Signed) JOHN BROWN.

MAY 15, 1900.

Some were found willing to promote the improvement in every way; individual effort to drain land was not uncommon, but usually ineffectual through want of combined action on the part of adjacent owners, poor construction and maintenance.

The drain constructed by the Metropolitan Water Works, a cross section of which is shown in Fig. 1, is designed to carry three quarters of an inch of rainfall collected in twenty-four hours, at a velocity not to exceed two feet per second; this capacity is deemed sufficient except at times of extreme high flow, too infrequent to warrant special provision therefor.

SECTION OF DITCH

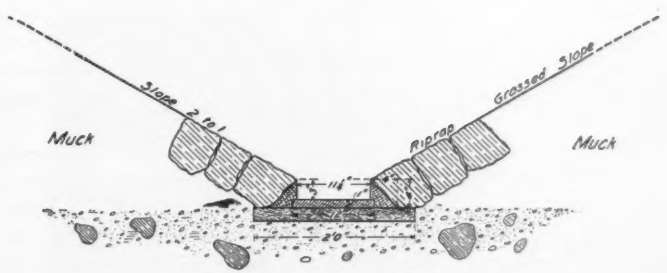

FIG. 1.

The drain has a board bottom, twelve inches wide, upper side planed, resting on mud-sills 2″ x 4″ x 2′, spaced about three feet apart and set flush with the ground; on either side are wood strips made of 4″ x 4″ stock, sawed on the diagonal and rabbeted to set

over the edge of the board about three eighths of an inch, serving as a footing for the stone paving on the sides of the channel, and to hold the boards in place when the nails used may give out through the action of rust.

The side slopes, two horizontal to one vertical, are protected by paving from six to nine inches thick, up to a point above the normal surface of the water; at all turns and connecting ditches the exposed slopes are protected by paving for the full height; paved gutters are made for influent streams coming in from the side. Fig. 1, Plate II, shows the clearing made through woodland, and Fig. 2 shows character of riprap placed, also including platform bridge placed at a farm-road crossing.

It will appear that straight line construction is necessary; but all deflections over thirty degrees are eased off by several short panels. In timber, sprout, or brush land, a clearing forty feet wide is made; this serves to keep falling leaves out of the ditch and during construction offers an opportunity for teams hauling lumber and stone to deliver material close by the work; the tree-tops, small brush, and swamp grass were often used to support the wagons over soft ground, and frequently both stone and lumber had to be carried in to the work from the nearest accessible point on hard land. Lumber was obtained in carload lots, and the haul from nearest railroad station averaged from one to three miles. All stones found in the excavations were used for paving, but were a small part of the amount required; the farmers donated many old walls; pasture lots furnished some by grubbing; and in some instances stones were purchased at ten cents per load and the farmers employed to haul them; this, however, was only done as a means to secure the ditching rights.

The depth of the ditches averages two feet, and varies between one and one-half and three feet. The excavated material was used to fill up all old brook courses and low places near by; any surplus was spread thin on the swamp side of the ditch and gaps left in the filling at frequent intervals and at all low places, to freely admit water into the ditch at times of freshet. For the convenience of the land owner, culverts or bridges over the drain are built at farm-road crossings and other points where necessary; watering places provided for grazing stock by depressing the bottom of the ditch from eight to twelve inches for the length of one board (usually sixteen feet), and taking out one or both sides of the ditch to a flat slope, and pro-

FIG. 1.—SHOWING CLEARING MADE IN WOODED SWAMP.

FIG. 2.—SHOWING RIPRAP PROTECTION AT CONNECTING DITCHES.

tecting the bottom with paving or gravel; the trough being in line with the ditch provides for free circulation and avoids the tendency to stagnation, which exists if placed on the side.

To explain method of construction: the clearing is made well in advance of excavation, and stumps found within the lines of the ditch are removed; a trench three feet wide, with vertical sides, is dug to within a few inches of grade; line and grade stakes are then driven in the trench every twenty-five feet, one foot off center and with a nail in the side one foot above sill grade; one man undercuts the sides to admit the paving, working to the line; another man or two remove the few inches of material remaining to grade; two men follow with spirit level, mattock, and rammer, setting the sills; two men in turn place the boards to line, nail to sills, and spike on the side strips; then come a gang of pavers, followed by a gang trimming slopes and grading.

The success, from the point of expense, of the work depends upon one operation following the other immediately; pumping is an expensive item, and one operation must be made to serve the board laying, paving, and sloping.

A succession of swamps, large and small, may often be found along the course of a brook, with various stretches of swiftly flowing water between; of course in this case the ditches are not made continuous, but sufficient work is done in the original brook bed to lead the water directly into the drain, and to secure a good run-off at the lower end; in this way, in connection with the 47 411 feet of improved ditch, 2 500 feet of the original brook courses were cleaned out and deepened.

Experience as usual proved a good teacher, and the work of the second season was accomplished at a lower cost than that of the first.

The work of swamp drainage was begun in 1898 by the Dam and Aqueduct Department; to the end of 1900 this department constructed 82 099 feet of ditches in the Sudbury watershed in connection with swamps draining into the open channel of the Wachusett Aqueduct, and 15 048 feet of ditches in the Wachusett watershed. The Sudbury department began work in 1899 and completed the improvement on five brooks tributary to the Sudbury Reservoir and Framingham Reservoir No. 3 during the following year.

The following table shows the cost of all the swamp drains constructed by the Sudbury department, exclusive of engineering: —

Location.	Timbered Ditch (Feet).	Total Cost.	Cost per Foot.
Angelico Brook	9 702	$3 904.83	$0.402
Brewer Brook	5 500	1 343.59	.244
Deerfoot Brook	7 876	2 449.61	.311
Mowry and Broad Meadow Brooks	24 333	5 717.76	.235
Total	47 411	$13 415.79	
Average			$0.283

The work was done by day labor, receiving $1.50 for nine hours' work; a few men were paid from $1.80 to $2.00 per day.

During 1900 a careful cost account was kept for the 24 333 feet of ditches on the Mowry and Broad Meadow Brook Improvement, as follows: —

LABOR COST ONLY.

Period. Sept. 1 to Dec. 8	Excavation and Clearing.	Timber Bottom.	Riprap and Stone Deliv.	Drilling and Blasting.	Culverts and Bridges.
Average cost per foot	0.093	0.024	0.052	0.004	0.006

Total average labor cost per lineal foot of ditch $0.179
Lumber, hardware, blasting supplies, etc..... .056
Total average cost per foot..... $0.235

STATEMENT OF WORK.

Length of drain through woodland, 13 410 feet.
Length of drain through meadowland, 10 923 feet.
9 stone culverts (average 2.8 x 2.6), 109 feet.
21 timber bridges, chestnut stringers, 2″ plank floor, average 8′ x 10′.
10 watering places.
2″ x 4″ spruce, average cost $13.50 per M, 16 535 feet B. M. used.
4″ x 4″ spruce (side rails) average cost $15.93 per M, 32 582 feet B. M. used.
1″ x 12″ spruce and Pennsylvania hemlock, average cost $17.11 per M, 25 171 feet B. M. used.

NOTE. — Lumber cost f. o. b. cars delivered.
Average cost of lumber per foot of ditch, $0.048.

It remains to be shown what improvement in color of water has been observed.

Since the construction of the ditches, color observations have been taken once each month, about the 15th, at a given point near the reservoir into which the brook flows. Prior to the improvement, color determinations had been made from the same points in the same way for a period covering at least one year, and in most instances a longer time.

The following table, prepared under the direction of Mr. Desmond FitzGerald, engineer of the Sudbury department, is intended to show the improvement up to May 15, 1901 : —

SUMMARY OF NORMAL COLORS AND REDUCTION OF COLORS BY DITCHING.

	Normal Color before Ditching.	Normal Color after Ditching.	Difference.	Reduction of Color, Per Cent.
Brewer Brook	0.70	0.58	0.12	17
Angelico Brook	1.15	0.79	0.36	31
Deerfoot Brook	1.27	0.90	0.37	29
Choate Brook	1.15	0.60	0.55	48
Outlet of Crane Swamp	1.81	1.08	0.73	40
Brigham's Pond Brook	0.81	0.59	0.22	27
Mowry Brook	0.63	0.48	0.15	24
Broad Meadow Brook	0.59	0.51	0.08	14
Average				29

Normal colors have been computed from observed colors by multiplying each observation by the yield of the Sudbury watershed for the month during which the observation was made, and dividing the sum of the products by the sum of the yields (multipliers).

It is known that local conditions may seriously affect the result of one observation, and it would appear desirable to have the ob servations made oftener than once a month or extended over a longer period before predicating results, but it seems conservative to expect a reduction of color of at least thirty per cent. from swamp drainage, and in aggravated cases it would probably be much greater.

In the above table the differences in the reduction of color are accounted for in the ratio of swamp area to total drainage area, the location of the swamp with reference to the outlet of the brook and the point at which color determinations are made. It is apparent that a greater reduction of color would follow when ninety per cent. of the entire yield passed through a swamp, than in a case where only twenty-five per cent. came in contact with the swamp.

The writer is of the opinion that with the maintenance of these drains and the gradual reclamation of swampy meadows by the land owners, which is reasonably sure to follow, and is even now in progress, the greatest improvement is yet to come.

It may be only a coincidence, but in the case of the Choate Brook, which shows the greatest improvement in color of any of the

brooks treated, a large, swampy meadow contiguous to the drain was immediately reclaimed by the owner and converted into a fine grass-producing meadow. Figs. 1 and 2, Plate III, show characteristic conditions observed before and after drainage.

DISCUSSION.

THE CHAIRMAN. With the exception of those cities and towns which depend entirely on driven well supplies, I suppose there is hardly a place which is not troubled at times with either a discoloration or a bad taste in the water. The subject is open for discussion.

MR. HORATIO N. PARKER.* Mr. Larned has pointed out that the drainage of the swamps is a very effective method of preventing the growth of microscopic organisms. I should like to emphasize this and recommend the speaker's treatment to the members as a means of reducing the evils from this source in their reservoirs. These swamp waters usually contain a large amount of carbonic acid, which recent experiments† have shown to be one of the chief food materials of the microscopic organisms; so when these waters come into a reservoir they not only may bring large growths but they are likely to stimulate the development of forms already living there. The two last pictures are very instructive. The swamp as we saw it in Fig. 1, Plate III, with its half-submerged vegetation and quiet water, was an ideal place for plankton development. A heavy rain will wash the organisms out of the swamp into the storage reservoir, where they are likely to grow and make the water unfit for drinking, on account of the unpleasant taste and odor which they produce. The second picture shows this danger entirely removed. Undoubtedly there are many supplies in the care of the gentlemen here to-day which would be greatly improved by drainage of the surrounding swamps. In addition to this, the drainage of these places would be of great benefit to the comfort and health of the communities in which they are situated, for these swamps are the breeding places of hosts of mosquitoes, which are terrible pests, and which modern science has shown to be the vehicles of malaria and other diseases.

THE CHAIRMAN. I will call upon Mr. Richards; I think he has had some experience in this matter.

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* Biologist, Metropolitan Water Works.

† Journal of the American Microscopical Society, 1901.

FIG. 1. — BEFORE DRAINAGE.

FIG. 2. — AFTER DRAINAGE.

MR. WALTER H. RICHARDS.* Mr. President and gentlemen, I happen to have had only one experience of this kind, and that was about ten years ago, when we drained a swamp of perhaps one hundred acres, by a method very similar to that the gentleman has described, except that we constructed our ditches on either side of the swamp and carried the upland water into our reservoir. The swamp happened to be so situated that we could take the water from the swamp and discharge that into another watershed outside of the watershed of our reservoir. By this means we took the water from the hillsides and carried it into our reservoir, and took the water from the swamp and carried it away from the reservoir. We were very successful in reducing the color. We did not make any exact determinations of the color, but the improvement was very apparent to the naked eye, from an extremely highly colored water to a water which was nearly white.

THE CHAIRMAN. I will now call upon Mr. Sherman.

MR. CHARLES W. SHERMAN.† Mr. President, I do not know that I can add anything to this discussion except a few words in regard to the figures upon which Mr. Larned has based the statements of the percentage of reduction of color. It fell to my lot to do most of the actual computing of those figures, and it is only fair to say that the reduction in color shown in many cases is the reduction in the color of the brook water near the point at which it is discharged into the reservoir, rather than near the outlet of the swamp. In the cases of the swamps which showed the largest percentage of reduction of color, which were forty and forty-eight, the observations, both before and after the improvement, were made at the outlet of the swamp, which was the same point as the point of discharge into the reservoir; that is, the swamp covered the whole area down to the reservoir, or to the main channel leading to it. In the other cases the swamps which were improved by ditching are situated rather near the limit of the watershed, and at a considerable distance from the reservoir proper, while the color observations were made at points near the reservoir; consequently the color before the improvement was made indicated the combined color of the water from the swamps and of a considerable quantity of upland water contributed to the brook below the swamp, that color, of course, being much less than the color of the water at the outlet of the swamp.

* Superintendent of Water Works, New London, Conn.
† Assistant Engineer, Metropolitan Water Works.

In the same way the color since the improvement was made, being at the same point, represents the color of a mixture of this same upland water and the water from the swamp which has been improved in color, an amount which, owing to lack of observation, is not directly determined. Consequently, where an improvement of perhaps fourteen or seventeen per cent. in color is shown, in all probability it means an actual improvement of from twenty-five to thirty-five per cent. in the color of the water discharged from the swamp in which the ditches were constructed. That point should be borne in mind in considering the apparently small percentage of reduction in color shown in some of the cases.

This condition is well shown in Fig. 2, which shows that part of the Sudbury watershed tributary to the open channel of the Wachusett Aqueduct, Sudbury Reservoir (formerly called No. 5), and Framingham Reservoir No. 3. The location of the ditches built is indicated by the heavy lines in or surrounding the swamps. The numbered points show *all* the points where observations of the color of the brook waters have been made at any time. The normal colors quoted by Mr. Larned were for the following points : —

Brooks tributary to Framingham Reservoir No. 3.

Brewer Brook, point (3).
Angelico Brook, point (5).

Brooks tributary to Sudbury Reservoir.

Deerfoot Brook, point (4).
Mowry Brook, point (15).
Broad Meadow Brook, point (20).

Brooks tributary to open channel of Wachusett Aqueduct.

Brigham's Pond Brook, point (4).
Crane Swamp, point (17).
Choate Brook, point (8).

Observations at other points were too few to warrant the computation of normal colors.

The Chairman. Mr. Brooks, I think, has had quite an experience with drainage on the Cambridge works.

Mr. Edwin C. Brooks.* I will say that although we have quite a large amount of swamp land tributary to our supply in Cambridge, very little has been done so far in the way of drainage. Our large

*Superintendent, Cambridge Water Works.

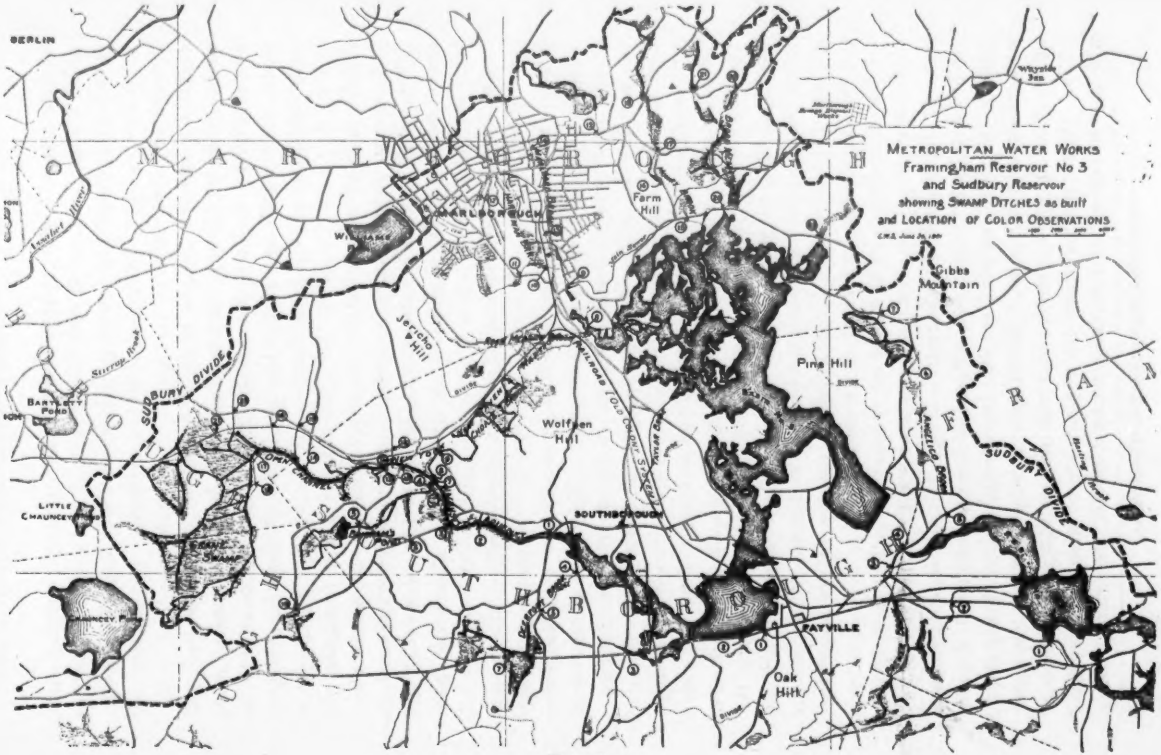
METROPOLITAN WATER WORKS
Framingham Reservoir No 3
and Sudbury Reservoir
showing SWAMP DITCHES as built
and LOCATION OF COLOR OBSERVATIONS
BERLIN
MARLBOROUGH
SOUTHBOROUGH
FAYVILLE
Farm Hill
Gibbs Mountain
Pine Hill
Jericho Hill
Wolfden Hill
Oak Hill
SUDBURY DIVIDE
Bartlett Pond
Little Chauncey Pond
Chauncey Pond
Brant Swamp
Sudbury River
Stirrup Road

FIG. 2.

storage reservoir has operated very well to bleach out the water which comes from the Hobbs Brook section, and so the color has been kept down in that branch of the works. We expect, however, to go on with quite a system of ditching, which we think will improve matters very materially.

THE CHAIRMAN. At the time of our meeting in New Bedford, some twelve or fifteen years ago, we noticed that the water there was so highly discolored that it was almost impossible to tell it from other liquids which New Bedford is noted for. Perhaps Mr. Coggeshall can give us some information.

MR. R. C. P. COGGESHALL.* That water came from the old Acushnet Reservoir, which was the original supply and which is not now in use. This basin is surrounded by numerous swamps, which is the reason of this discoloration. Since the introduction of the new supply, in 1899, all our water is taken directly from Little Quittacas Pond.

MR. LARNED. An instance of organic contamination which may be of some interest, and perhaps is known to some of the gentlemen present, I had occasion to look into in connection with the water supply of Butte, Mont., a few years ago. They were constructing a new reservoir there, and, although it was unfinished, the reservoir had been allowed to partially fill, and they were using the water from it. At the head waters of the reservoir was a large swamp. At one season of the year, I think it was in June or July, the water became so foul that it was unsuited to almost all domestic uses. The color was a very dark chocolate. You could not destroy the odor by boiling; it tainted potatoes; it could not be used in making coffee; it was absolutely unfit to bathe in; and it was so noxious to smell that the City Fathers contemplated passing an ordinance forbidding its use for sprinkling the streets.

I have n't heard what was finally done. I believe one of the superintendents of the company was sent East to advise with experts in the matter, and swamp drainage was advised; and, as a preliminary betterment, they advised the construction of a flume leading from the head waters of the swamp around the swamp, which I believe was done. But it took a long time for the water to improve in the reservoir, and the community suffered meanwhile. It was harvest time for the owners of many little springs which are located in the valleys about there, the water being

*Superintendent, New Bedford Water Works.

peddled out, at the rate of from ten to fifteen cents a pail, through the town.

THE CHAIRMAN. We should be glad to hear from any one else who has had any experience in this matter.

MR. LEONARD METCALF.* There are one or two questions I should like to ask Mr. Larned. One is in regard to the grades at which some of these ditches have been laid, how flat the grades are; and the other is in regard to maintenance, whether it is found necessary once or twice a year to go over the ditches with a squilgee, or something of that sort, to clean them out, and how much material is washed in.

MR. LARNED. I stated, I believe, in the text of the paper, that the velocity was kept down to something under two feet per second. The grade which was followed to attain that velocity was generally about one foot in one thousand feet; and in many cases, where we did n't have a fall through the swamp and were required to secure this velocity in the water surface itself, we built deeper ditches, sometimes almost level.

In connection with the maintenance of the ditch, and perhaps the life of the ditch, it may be of interest to state that that will depend somewhat upon the board bottom being kept covered with water. Some of these ditches have been in existence now for about three years, and I believe they are in a fair state of preservation to-day. But it is conceivable with following periods of wet and dry the boards might rot rather rapidly.

The maintenance of the work requires one or two men to go over the ditches perhaps twice a year. In the spring of the year there may be a small amount of débris that has blown in or collected in the ditch, and that is very readily removed by a man taking a square-pointed shovel, — the width of the ditch is about eleven inches and a quarter, just a trifle more than the width of the shovel, — and he simply walks along the smooth bottom, pushing the shovel before him until he collects a shovelful of material, which he throws on the side of the ditch. There were about twenty-three thousand feet of ditches constructed the first season, and the total cost of cleaning them out, making needed repairs to the side slopes and paving due to frost upheaval, etc., amounted to about twenty-five dollars the first season, or about one dollar per one thousand feet.

MR. COGGESHALL. Previous to 1886 the only supply of the city

*Civil Engineer, Boston, Mass.

of New Bedford was from the Acushnet Reservoir. That supply became scant at times, and a drought in the latter part of 1886 necessitated prompt action in procuring an additional supply. Less than two miles north of the head waters of the Acushnet Reservoir is Quittacas Pond, which is now our source of supply. We put men at work and dug a ditch something less than a mile and a half long, and for over a mile the sides are laid with plank and braced. The grade of the bottom of the ditch is not over a foot in its whole length. That served the purpose for which it was intended up to the time the new supply was introduced in 1899, and it is in good condition to-day, so that it would be easy to get from three to four million gallons a day from Little Quittacas Pond into the Acushnet Reservoir through that ditch.

REPORT OF COMMITTEE ON UNIFORM STATISTICS.

JOSEPH E. BEALS, GEORGE F. CHACE, JOHN C. WHITNEY, *Committee.*

[*Presented January 8, 1902.*]

Mr. Joseph E. Beals, chairman of the Committee on Uniform Statistics, presented the following report : —

The Committee on Uniform Statistics, after spending considerable time upon the subject, although there were but two or three conferences of the whole committee, would recommend for adoption by the Association the form which has been in use for the last fifteen years, with a few alterations. The report, which we herewith submit, is practically the embodiment of the memoranda presented by the Editor of the JOURNAL at one of our conferences. Our report was written last September, but it failed to reach the Portland Convention. The writing of it was left to me, and, after I had prepared it, I sent it to the second member of the committee, Mr. Chace; and he sent it to the third member, Mr. Whitney; and Mr. Whitney says he sent it then to the Secretary of the Association, but it has disappeared from sight somewhere. The best I can do, therefore, in the way of a report now is to present to you the form which our Editor has had printed, and which embodies the ideas that were suggested when he was present at one of the meetings of the committee.*

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* Since the January meeting, the original report of the Committee has been found. It is as follows: —

SEPTEMBER 16, 1901.

To the Officers and Members of the New England Water Works Association:

GENTLEMEN, — The Committee appointed by you to consider the question of the preparation of statistics respectfully report that they have given the subject somewhat careful consideration, and would recommend that the old form which has been in use since the formation of the Association be, in the main, continued, with such few alterations as new and changed conditions seem to make advisable. For this purpose we have taken the blank schedule sent out by Mr. Sherman, our Editor, and noted such alterations as we deem advisable.

We would also advise that another section be added, covering information from plants which are making chemical and bacteriological examinations of water.

Respectfully submitted,

JOSEPH E. BEALS,
GEO. F. CHACE,
J. C. WHITNEY,
} *Committee.*

I may say that we have received communications from eight or ten water organizations and statistical organizations asking for information, and in reply have sent to most of them the printed form that we have heretofore used. In very few cases have we received any suggestions from these other organizations, but in almost every instance the request has been made by them for us to furnish suggestions if we had any to make. We, therefore, present our own form, which we have used in the past, as the form which we recommend for us in the future, with a few changes, to some of which I will briefly call attention.

Under the head of "Pumping" there have been some changes in phraseology. For instance, "Description of Fuel Used" specifies "*a*. Kind," "*b*. If coal, what brand?"— the old headings were "*a*. Anthracite" and "*b*. Bituminous"—"*c*. Average price of coal per gross ton, delivered." We put it gross ton, as it stood in the former recommendation, but if I were going to alter that I should say, "per net ton," as I think 2 000 pounds is easier reckoning than 2 240. Then we insert 4*a*, "Amount of other fuel used," for we find that in some water works they use other fuels. Gasolene is being used quite largely, and naphtha, and in one or two places sawdust is used as fuel. I cannot from recollection specify all the alterations we have made under the head of "Pumping," but there are a few others.

Under the head of "Financial," we have modified the Maintenance table so as not to call for reports giving statistics for receipts for water for manufacturing purposes. We found when we came to tabulate the figures of receipts for manufacturing purposes that there was so much difference in the practice, that it was perhaps better to leave the word "manufacturing" out and simplify the rate; and we have therefore called for water rates by fixture, water rates by meter, and net receipts for water; and then for miscellaneous receipts for rent, repairs, sales, etc., and then for the total from consumers. Then come the receipts from public funds, F, G, H, I, and J, — hydrants, fountains, street watering, public buildings, and general appropriations. Probably in a good many cases the first four would be put under the head of "General Appropriations." I know that in the works that I represent we make a lump sum of those as a total from public funds. We found in tabulating that some of the works make a practice of carrying a balance forward, while others cover their balances into the town or city or district treasuries; but,

inasmuch as some of them bring forward a balance from year to year, we have provided a place for that in the table.

We have made very few changes under the head of "Financial — Construction." Instead of special rates of interest, we provide for the average rate of interest, and under "Expenditures" we have put in "Extension of meters." Under "Consumption" I think we suggest no change. Under the head of "Distribution," in the old form item No. 7 called for the number of leaks, and some cities returned the number per mile, and some the total number of leaks they actually had, so that in making up the statistics the Editor found it was sometimes quite difficult to tell which was meant. For instance, if a works reported, as some did, only one leak, it was difficult to tell whether it was one leak per mile or one leak in the whole system. I recollect that in the operation of my works during one year I not only did n't have one leak per mile, but not one leak in the whole system even. Then under "Services" we have had added one or two things, for example, No. 27, "Percentage of services metered," and No. 28, "Percentage of receipts from metered water." No. 23, "Average length of service," would be the total length of services divided by the number of services.

BLANK FORM FOR

SUMMARY OF STATISTICS.

Draw a line through items not applicable to the works under consideration, leaving the number on the items used *unchanged.*

Pumping. — (6.) Cross out "with" or "without," to indicate whether slip has been taken into consideration.

(8.) The dynamic head is indicated by pressure gage at pumping engine.

(10.) Only one formula for duty is here presented. It is hoped that for the sake of uniformity this formula will be strictly followed in this summary. Other methods may, if desired, be used in the body of the report.

(11, 12.) The pumping station expenses for this statement are to include only *Cost of Fuel, Salaries, Oil, Waste, and other supplies,* and *Repairs on Machinery and Boilers.*

(13, 14.) Item CC under *Financial* is the amount to be used in obtaining these figures.

Special Notice. — Please send a copy of each report in which a summary of statistics appears to the New England Water Works Association, 715 Tremont Temple, Boston.

SUMMARY OF STATISTICS

For the year ending.....

In form recommended by the New England Water Works Association.

.....WATER WORKS.

..... (City or Town.) ..... (County.) ..... (State.)

Population by Census of 19 ,.....

Date of Construction,.....

By whom owned,.....

Source of supply,.....

Mode of supply,..... (Whether gravity or pumping.)

PUMPING.

1. Builders of Pumping Machinery,.....
2. Description of Fuel used,
   - *a.* Kind,.....
   - *b.* If coal, what brand?.....
   - *c.* Average price of coal per gross ton, delivered, $.....
   - *d.* Percentage of ash,.....
   - *e.* Wood, price per cord, $.....
   - *f.* Other fuel, price, $.....
3. Coal consumed for the year,.....lbs.
4. [Pounds of wood consumed] ÷ 3 = equivalent amount of coal,..... lbs.

4*a*. Amount of other fuel used,.....

5. Total equivalent coal consumed for the year = (3) + (4),..... lbs.
6. Total pumpage for the year,..... gallons, { with / without } allowance for slip.
7. Average static head against which pumps work,.. .....feet.
8. Average dynamic head against which pumps work, ... feet.
9. Number of gallons pumped per pound of equivalent coal (5),.....
10. Duty = $\frac{\text{gallons pumped (6)} \times 8.34 \text{ (lbs.)} \times 100 \times \text{dynamic head (8)}}{\text{Total fuel consumed (5)}}$ =.....

Cost of pumping, figured on pumping station expenses, viz., $.....

11. Per million gallons pumped, $.....
12. Per million gallons raised one foot (dynamic), $.....

Cost of pumping, figured on total maintenance, viz., $.....

13. Per million gallons pumped, $.....
14. Per million gallons raised one foot (dynamic), $.....

FINANCIAL.

MAINTENANCE.

RECEIPTS.		EXPENDITURES.	
Balance brought forward	$.....	AA. Management and repairs	$.....
From Consumers:		BB. Interest on bonds	.....
A. Water rates, fixture,	$.....	CC. Total maintenance for year	$.....
B. Water rates, meter,	.....	DD. Balance	.....
C. Net receipts for water, (A) + (B),	$.....		
D. Miscellaneous (rent, repairs, sales, etc.)	.....		
E. Total from consumers	$		
From Public Funds:			
F. Hydrants . .	$.....		
G. Fountains . .	.....		
H. Street watering .	.....		
I. Public buildings	.....		
J. Gen'l appropriations	.....		
Total from public funds . .	.....		
K. Gross receipts from all sources . . .	$.....	K. Total	$.....

FINANCIAL.

CONSTRUCTION.

Receipts.			Expenditures.		
Q.	From balance of previous year	$.....	FF.	Extension of mains	$.....
R.	,, Bonds issued	.....	GG.	Extension of services	.....
S.	,, Appropriations from tax levy	.....	HH.	Extension of meters	.....
T.	Transferred from maintenance account	.....	II.	Special (reservoirs, pumps, etc.)	.....
U.	From other sources	.....	JJ.	Total construction for year	$.....
			KK.	Balance	.....
V.	Total	$.....	V.	Total	$.....

W. Net cost of works to date . . . . . $.....

X. Bonded debt at date . . . . . $.....

Y. Value of sinking fund at date . . . . . $.....

Z. Average rate of interest,..... per cent.

CONSUMPTION.

1. Estimated total population at date,.....
2. Estimated population on lines of pipe,.....
3. Estimated population supplied,.....
4. Total consumption for the year,.....gallons.
5. Passed through meters.....gallons.
6. Percentage of consumption metered,.....
7. Average daily consumption,.....gallons.
8. Gallons per day to each inhabitant (1),.....
9. Gallons per day to each consumer (3),.....
10. Gallons per day to each tap (taps in use),.....

DISTRIBUTION.

MAINS.

1. Kind of pipe,.....
2. Sizes, from.....inch to .....inch.
3. Extended.....feet during year.
4. Discontinued.....feet during year.
5. Total now in use,.....miles.
6. Cost of repairs per mile, $.....
7. Number of leaks per mile,.....
8. Length of pipes less than 4 inches diam.,.....miles.
9. Number of hydrants added during year (public and private),.....
10. Number of hydrants (public and private) now in use,.....
11. Number of stop gates added during year,.....
12. Number of stop gates now in use,.....
13. Number of stop gates smaller than 4-inch,.....
14. Number of blow-off gates,.....
15. Range of pressure on mains at center of town,.....lbs. to.....lbs.

SERVICES.

16. Kind of pipe,.....
17. Sizes,.....
18. Extended,.....feet.
19. Discontinued,.....feet.
20. Total now in use,.....miles.
21. Number of service taps added during year,.....
22. Number now in use,.....
23. Average length of service,.....feet.
24. Average cost of service for the year, $.....
25. Number of meters added,.....
26. Number now in use,.....
27. Percentage of services metered,.....
28. Percentage of receipts from metered water (B ÷ C),.....
29. Number of motors and elevators added,.....
30. Number now in use,.....
31. Number of standpipes for street watering,.....

DISCUSSION.

MR. R. C. P. COGGESHALL.* I suppose the number of leaks per mile you would have to express in decimal. That is, if there were one hundred miles of mains in a system and there were twenty-five leaks, it would be twenty-five hundredths of a leak for each mile.

MR. BEALS. That is what it would be, twenty-five hundredths of a leak per mile.

MR. COGGESHALL. I don't see any other way to express it.

MR. BEALS. We changed that because some report the number of leaks during the year and some report the number of leaks per mile. Of course, twenty-five hundredths of a leak would be a small figure, but it would make the amount of leakage clearer than if there were stated to be twenty-five leaks and you did n't look to see that there were one hundred miles of pipe.

MR. M. N. BAKER† (*by letter*). A committee of the Central States Water Works Association has recommended the use of the present New England schedule, pending further developments. The American Water Works Association, at its last meeting, appointed a committee to coöperate with others in this matter. A committee of the American Society of Municipal Improvements several years ago submitted a schedule for water-works statistics.

It is now hoped that by next spring the various committees named above, together with committees from the National Municipal League and the American Economic Association, may agree upon a common schedule. The chief difficulty is to devise a summary of statistics brief and simple enough for general adoption, yet sufficiently comprehensive to include many of the details of water-works practice eagerly sought by the water-works officials of the present day.

It has been suggested that two schedules be provided — a sort of longer and shorter catechism. Why could not the original New England schedule serve as the shorter, and that of the American Society of Municipal Improvements be adopted as the longer summary? It has been urged that the Municipal Improvement schedule contains everything that is in the New England, and much besides. I have compared the two with some care and find that this is not far from the truth. Certainly it would be an easy matter to insure exact correspondence, except in the matter of length.

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*Superintendent of Water Works, New Bedford, Mass.

† Associate Editor, *Engineering News*.

I hope it may prove possible for the New England Water Works Association to preserve its old schedule practically unchanged for some months longer, until there has been one more attempt to bring the various societies together. If that attempt does not succeed I shall then recommend the several committees of which I am a member to adopt the then existing schedule of the New England Water Works Association. Of course there can be no harm in making a few minor changes in the schedule meanwhile, so long as they leave the general plan and scope of the New England schedule open, and do not commit it to seeming independence of action.

If it seems wise to the other members of the Association, I suggest: That the present committee be continued, with power to coöperate with committees of other societies in an effort to secure the adoption of a uniform summary of water-works statistics suitable for annual reports, and ultimately at least a nearer approach to uniformity in water-works accounting.

Mr. Beals. The committee recognized that possibly the Association might desire to add one or two items regarding purification and filtration of waters, and the chemical and perhaps biological examinations. As I remember it now, that was recommended in the report which was prepared. I want to say further that our efforts have been to simplify these statistics rather than to add complications. Many of our members make up their reports at about this time of the year, which is a very busy season with them, and it sometimes would require more labor than we feel we have time to put into it, especially if we should add everything that some people, whom I may call cranks on the subject of statistics, want to have added to the statistics. We could very easily double the length of these tables by adding everything we could think of to ask for in the way of statistics, but I fear the result would be that we would find we would n't get anything answered. The fact now is that, up to the beginning of 1900, we were only able to get twenty-eight reports, and those were not all from our own members, either; but they were all we could get from reported statistics in the annual reports. Since then our Editor, by personal correspondence and sending out blanks similar to this, has succeeded in getting sixty reports. But the fact that he could only get sixty shows either that there is a desire not to make such reports, or else that our members have n't time to fill in the information. We hope that by making the thing very simple we may be able to get from the busy members better returns

than we would if we made the blank so extended and so elaborate that gentlemen would merely look at it and throw it one side.

MR. C. W. SHERMAN.* So many members had gone out near the close of our last meeting, that it may be well for me now to call attention to the fact that at my request, as I wanted to send the blanks out so that the superintendents could use them in making up their returns for the past year, the meeting then endorsed the use of this printed form for summarizing the reports for 1901. Of course we did not accept it beyond that.

MR. COGGESHALL. I should like to ask Mr. Beals, the chairman of the committee, if he does not think it would be a good idea to add Mr. Baker to the committee, as he seems to have made a special study of this subject, and then continue the committee for a while longer.

MR. BEALS. As Mr. Baker is a member of this organization, as well as of several others of a kindred nature, I think it might aid in bringing about a unity of sentiment if he were either added to the committee or substituted for some one of the members. I should be perfectly willing that the committee be discharged and a new one be appointed with Mr. Baker at the head of it.

MR. DEXTER BRACKETT. To put this in some concrete form, I will move, as I believe that the subject is one of importance, and in view of the fact that it may be wise to include some other statistics, that the committee be continued, with the addition of Mr. M. N. Baker and of our Editor, Mr. C. W. Sherman, as members, to make such further investigation as they may deem expedient.

Adopted.

* Editor, JOURNAL OF THE N. E. W. W. ASSOCIATION.

PROCEEDINGS.

December Meeting.

Young's Hotel, Boston, Mass.,
December 11, 1901.

Past President Horace G. Holden in the chair.
The attendance was as follows: —

Members.

Charles H. Baldwin, Lewis M. Bancroft, George W. Batchelder, Joseph E. Beals, James W. Blackmer, George Bowers, Dexter Brackett, Fred Brooks, George F. Chace, John C. Chase, Freeman C. Coffin, R. C. P. Coggeshall, J. W. Crawford, F. F. Forbes, W. E. Foss, F. B. French, F. L. Fuller, J. F. Gleason, Albert S. Glover, Amos A. Gould, J. A. Gould, Frank E. Hall, John O. Hall, L. M. Hastings, Horace G. Holden, J. L. Howard, E. W. Kent, Willard Kent, C. F. Knowlton, Edward S. Larned, Charles S. Lord, A. E. Martin, William E. Maybury, Leonard Metcalf, H. N. Parker, J. H. Perkins, Macy S. Pope, J. B. Putnam, W. H. Richards, W. W. Robertson, Harley E. Royce, Caleb M. Saville, Walter H. Sears, P. P. Sharples, Charles W. Sherman, H. O. Smith, Frederic P. Stearns, J. J. Sullivan, William F. Sullivan, Charles N. Taylor, Lucian A. Taylor, H. L. Thomas, R. J. Thomas, William H. Thomas, D. N. Tower, W. H. Vaughn, W. W. Wade, William Wheeler, John C. Whitney, G. E. Wilde.

Associates.

The George F. Blake Mfg. Co., by A. F. Hall; Harold L. Bond & Co., by Harold L. Bond; Builders Iron Foundry, by F. N. Connet; Chadwick-Boston Lead Co., by A. H. Brodrick; Chapman Valve Co., by Edward F. Hughes; Charles A. Claflin; Coffin Valve Co., by H. L. Weston; M. J. Drummond, by Walter E. Drummond; Garlock Packing Co., by Horace A. Hart; Hersey Mfg. Co., by Albert S. Glover; Henry F. Jenks; Lead-Lined Iron Pipe Co., by Thomas E. Dwyer; Ludlow Valve Mfg. Co., by H. F. Gould; National Meter Co., by Charles H. Baldwin and J. G. Lufkin; Neptune Meter Co., by H. H. Kinsey; Perrin, Seamans & Co., by J. C. Campbell; Rensselaer Mfg. Co., by Fred S. Bates; A. P. Smith Mfg. Co., by W. H. Van Winkle; Sumner & Goodwin Co., by F. D. Sumner; United States Cast Iron Pipe and Foundry Co., by L. R. Lemoine; Walworth Mfg. Co., by R. S. Mitchell; R. D. Wood & Co., by E. F. Krewson.

GUESTS.

H. V. Macksey, Boston Water Works, Boston, Mass.; L. S. Doten, C. E., Boston, Mass.; Samuel C. Hunt, Member Water Board, New Bedford, Mass.; W. C. Livermore, Holyoke, Mass.; M. J. Dowd and H. C. Taft, Water Commissioners, Lowell, Mass.; James T. Stevens, Water Commissioner, Braintree, Mass.; C. A. Donovan, Member Water Board, Lawrence, Mass.; H. C. Stillwell, Marion, Ohio; E. J. Sanburg, Quincy, Mass.; E. P. Walters, A. F. Bridgman, Metropolitan Water Works, Boston, Mass.; F. A. Morrison, W. H. Greenwood, F. W. Blanchard, Boston, Mass.; L. P. Woods, Boston, Mass.; W. I. Edwards, Londonderry, N. S.

Edward S. Larned, C. E., Metropolitan Water Works, South Framingham, Mass., read a paper entitled "Swamp Drainage for Watershed Improvement." The paper was discussed by Horatio N. Parker, Biologist, Metropolitan Water Works; Walter H. Richards, Superintendent, New London; Charles W. Sherman, Assistant Engineer, Metropolitan Water Works; Edwin C. Brooks, Superintendent, Cambridge; R. C. P. Coggeshall, Superintendent, New Bedford, and Leonard Metcalf, Civil Engineer, Boston.

The report of the Committee on "Standard Specifications for Cast-iron Pipe" was presented by Mr. Freeman C. Coffin, chairman of the committee. Written communications discussing the report were received from Emil L. Nuebling, Engineer and Superintendent of the Water Department, Reading, Pa.; Frank A. McInnes, Assistant Engineer, Engineering Department, Boston, and Louis H. Knapp, Engineer, Buffalo Water Works.

There was also oral discussion by L. R. Lemoine, representing the United States Cast Iron Pipe and Foundry Co.; Edmund F. Krewson, representing R. D. Wood & Co.; W. I. Edwards, representing the Montreal Pipe and Foundry Co.; Dexter Brackett, Engineer Distribution Department, Metropolitan Water Works, and also a member of the committee; Walter H. Richards, Superintendent, New London; H. V. Macksey, of the Boston Water Works; J. A. Gould, Chief Engineer of the Brookline & Dorchester Gas Light Companies, and Frank L. Fuller and E. H. Gowing, Civil Engineers.

On motion of Mr. Robert J. Thomas it was voted to continue the discussion of the report at the January meeting.

SUMMARY OF STATISTICS.

MR. CHARLES W. SHERMAN. Before the meeting adjourns, as it is evidently too late to receive the report of the Committee on Uni-

form Statistics this afternoon, I should like to call attention to one matter, which will take but a moment of your time, in that connection. I have anticipated the acceptance of what, perhaps, I might call the preliminary report of the committee, to the extent of having blank forms printed for use in preparing the annual reports for 1901. If we wait until another meeting to endorse the use of these, it will be too late for many of the members. I might say, as many of you know, that I was in consultation with the committee at its meeting before the Portland Convention, and at that time they decided to recommend certain slight changes in the form now in use, and these blanks which I have had printed embody those recommendations. I do not wish to have you adopt the form offhand in this way for indefinite future use; but I do wish that this meeting would pass a vote authorizing its use for the current year, as it is but a slight modification of the form previously used. I will make that as a motion, that the Association endorse the use of the form now printed, including the recommendations of the committee, for the reports of 1901.

Adopted.

MR. R. J. THOMAS. I wish to state for the information of the members who may wish to buy pipe before the specifications are settled upon, that if they will consult the pages of the JOURNAL they will find the advertisements there of foundrymen who are willing to do work as required by these specifications which have been submitted.

Adjourned.

PROCEEDINGS.

Annual Meeting.

Young's Hotel,
Boston, January 8, 1902.

President Crandall in the chair.

The following members and guests were present: —

Members.

Lewis M. Bancroft, Roland D. Barnes, Joseph E. Beals, James F. Bigelow, George Bowers, Dexter Brackett, Fred. Brooks, L. Z. Carpenter, George Cassell, George F. Chace, G. L. Chapin, John C. Chase, Freeman C. Coffin, R. C. P. Coggeshall, F. H. Crandall, J. W. Crawford, M. F. Collins, L. E. Daboll, A. O. Doane, H. A. Fiske, F. F. Forbes, J. F. Gleason, Albert S. Glover, J. A. Gould, E. H. Gowing, J. O. Hall, J. C. Hammond, Jr., D. A. Harris, H. G. Holden, E. W. Kent, Willard Kent, George A. Kimball, James W. Locke, Frank E. Merrill, Leonard Metcalf, Macy S. Pope, C. E. Riley, H. E. Royce, W. H. Sears, E. M. Shedd, Charles W. Sherman, J. Waldo Smith, George H. Snell, George A. Stacy, F. P. Stearns, William F. Sullivan, C. N. Taylor, L. A. Taylor, D. N. Tower, George W. Travis, W. H. Vaughn, William W. Wade, William Wheeler, George E. Wilde, F. B. Wilkins.

Associates.

Harold L. Bond & Co., by Harold L. Bond; Builders Iron Foundry, by F. N. Connet and H. J. Burroughs; Chapman Valve Co., by Edward F. Hughes; Coffin Valve Co., by H. L. Weston; Hersey Mfg. Co., by Albert S. Glover; Lead-Lined Iron Pipe Co., by Thomas E. Dwyer; Ludlow Valve Mfg. Co., by H. F. Gould; National Meter Co., by J. G. Lufkin; Neptune Meter Co., by H. H. Kinsey; Perrin, Seamans & Co., by J. C. Campbell; Rensselaer Mfg. Co., by Fred S. Bates; Union Water Meter Co., by J. P. K. Otis.

Guests.

H. V. Macksey, Boston Water Works, Boston, Mass.; T. J. Burke, Water Commissioner, Brookline, Mass.; G. S. Hedge, Boston, Mass.; Charles Donovan and A. H. Robinson, Water Commissioners, Lawrence, Mass.

The following applicants were elected to membership, having been recommended by the Executive Committee: —

Resident Members.

Leonard S. Doten, Boston; James F. Stevens, Brockton, Chairman Brockton Water Board.

Non-Resident Members.

Thomas Archibald MacLean, Charlottetown, P. E. I.; James M. Betton, New York.

Associate.

Montreal Pipe Foundry Co., Ltd., Manufacturers of Cast-Iron Water Pipes and Special Castings, Londonderry, N. S.

The President appointed Messrs. D. N. Tower and C. N. Taylor as tellers to count the ballots for officers for the year 1902.

PRESIDENT'S ADDRESS.

President F. H. Crandall, of Burlington, Vt., then delivered the following address: —

With matters of considerable interest and importance pressing for attention, I will take no more of your time than necessary to briefly touch upon the subjects upon which it has become customary to expect a word from a retiring president.

Before taking up the perfunctory part of the program, I wish to thank you for the honor conferred upon me a year ago, as well as for your forbearance and assistance since.

The hope expressed by our President at the Burlington Convention, in 1895, that each of his successors might, in turn, enjoy the pleasure then accorded him, of reporting the Association larger, stronger, and more powerful for good than ever before, has been amply gratified. We can again congratulate ourselves on the completion of a year of wonted growth and activity.

The results of the provision, made at the Rutland Convention, for the improvement of the JOURNAL, we have all had an opportunity to see in the JOURNAL itself, though I doubt if any of us half appreciate the untiring diligence of our able Editor. The index which Mr. Sherman has under way, when put up in card form, and kept at headquarters, up to date, will materially add to the value of

headquarters. I had hoped to approve a bill for this card index, but I understand that though, like most good things, slow in coming, it is on the way.

The work of the past season I will not attempt to review. Matters of interest and importance have occupied our attention at each meeting, and the indefatigable efforts of our genial Secretary have resulted in placing in his hands several more interesting and instructive papers than there has thus far been opportunity to present at the meetings of the Association.

Our financial condition is, according to the Micawberian standard, one of perfect happiness. Our expenditures have been less than our receipts, and the balance, to-day reported by our Treasurer, is less than that of his last report only because we have paid several bills incurred during preceding years as well as all bills contracted during the year just past.

Death has, during the past year, claimed eight of our members: William H. Laing, Superintendent and Secretary, Racine Water Company, Racine, Wis.; Samuel G. Stoddard, Jr., Superintendent and Engineer, Bridgeport Hydraulic Company, Bridgeport, Conn.; Patrick F. Crilly, Superintendent, Woburn Water Works, Woburn, Mass.; Jo H. Linsley, Director Vermont State Laboratory, Burlington, Vt.; Henry W. Rogers, Haverhill, Mass.; John H. Decker, Brooklyn, N. Y.; James M. Battles, Superintendent, St. Mary's House for Sailors, East Boston, Mass.; Arnold H. Salisbury, Superintendent, Lawrence Water Works, Lawrence, Mass.

To the untiring energy and persistence of Dr. Jo H. Linsley is due the recent notable advancement in matters pertaining to the public health of Vermont.

Henry W. Rogers was a founder and past-president of the Association.

John H. Decker was a founder of the American Water Works Association.

The yeoman service rendered by James M. Battles, here at home, where charity and missionary work should begin, will long be remembered in this port.

A. H. Salisbury, owing to his general temperament and frequent attendance upon our meetings, was probably the most well-known among us of those who have been called to the other shore. As at this time we devote a brief space to those who, during the year past, have passed away, we may derive some comfort and encouragement

from the knowledge that "no life can be pure in its purpose and strong in its strife, and all life not be purer and stronger thereby."

The water supply engineer of to-day has a delicate and thankless task on his hands. The demand for the learned and intricate is not alone made upon the medical profession, though the case of the lady seeking to learn why some people are born blind is a most striking example of the prevalent demand. Many of you, no doubt, recollect the reply of the learned oculist. He said, "I suppose, madam, that the phenomenon of which you speak is the result of the parties in question having come into this world physically incapacitated to perceive the light," whereupon the good lady gave expression to her appreciation of a physical education, remarking that she had asked her husband the same question many times, and all that she could get out of him was, "Kase they is." It is up to the engineering profession to cause an engineering education to be equally appreciated.

If the supply be short because more water is wasted than can be used, public opinion requires that the remedy be sought in increased pumping facilities, or in elaborate plans for an increased supply, rather than in the conservation of the supply at hand.

When considering the huge discrepancy usually existing between the pumping record and the amount of water accounted for, public opinion requires that evaporation, the error of the meter, the aggregate of a vast number of small leaks, and, perhaps, in a general way, losses from other causes, be marshaled in explanation of what is, by popular fallacy, designated a strange and unaccountable condition.

Public opinion in these matters, striving for an intricate and learned explanation of a plain and simple proposition, stands in much the same position as did the Maine editor, who sought to explain, in a supernatural manner, the advent of his first-born. He said: —

"One night as old St. Peter slept,
He left the doors of heaven ajar,
When through a little angel crept.
And came down with a falling star.

"One summer, as the blessed beams
Approached, my blushing bride
Awakened from some pleasant dreams,
And found the little angel by her side.

"God grant but this, I ask no more,
That when he leaves this world of pain,
He 'll wing his way to that bright shore,
And find the path to heaven again."

And yet no one has come forward to set public opinion right.

You, no doubt, remember that John G. Saxe, taking issue with the down-east editor, stated the plain, unvarnished facts in regard to that little every-day occurrence, in a manner so straightforward and convincing as to leave no room for argument. He said, speaking for St. Peter: —

"Full eighteen hundred years or more,
I've kept my doors securely fast,
There has no little angel strayed
Or recreant through the portal passed.

"I have not slept, as you suppose,
Nor left the gates of heaven ajar,
Nor has a little angel strayed
Or gone down with a falling star.

"Go ask that blushing bride, and see
If she don't frankly own and say,
That when she found that angel babe,
She found it in the good old way.

"God grant but this, I ask no more,
That should your numbers still enlarge,
You 'll not do as you 've done before,
And lay it to old Peter's charge."

REPORT OF EXECUTIVE COMMITTEE.

President Crandall. I had not understood until this moment that I was expected to make a report for the Executive Committee, but inasmuch as I am now informed that I am, I will say that the affairs of the Association appear to the Executive Committee, so far as we have consulted with each other, to have been carried on during the past year in a satisfactory and businesslike manner. The only suggestions we have to make are that in the future the report of the officer who is in position to know in regard to the matter should include a statement of the liabilities and assets of the Association; and that the place for holding the annual convention should be fixed upon at as early a date as possible.

REPORT OF THE TREASURER AND FINANCE COMMITTEE.

Mr. Lewis M. Bancroft, Treasurer, then submitted his report. On motion of Mr. Coggeshall the reading of the details was dispensed with. The report is as follows: —

LEWIS M. BANCROFT, Treasurer, *in account with*

RECEIPTS.

1901.				
January 1.	Balance on hand			$2 108.24
16.	Received of Willard Kent, Secretary	$173.50		
February 9.	" " " " "	301.62		
18.	" " " " "	211.25		
March 5.	" " " " "	216.00		
22.	" " " " "	61.95		
April 4.	" " " " "	125.23		
May 7.	" " " " "	86.90		
13.	" " " " "	172.80		
31.	" " " " "	119.50		
June 15.	" " " " "	172.95		
28.	" " " " "	93.30		
July 10.	" " " " "	379.50		
17.	" " " " "	354.00		
August 16.	" " " " "	359.00		
October 9.	" " " " "	233.40		
November 13.	" " " " "	153.78		
21.	" " " " "	360.80		
December 2.	" " " " "	193.95		
1902.				
January 8.	" " " " "	424.45		4 193.88
1901.				
August 16.	Dividend, Peoples Savings Bank			43.72
October 9.	Interest on deposit, National Bank			.95
				$6 346.79

The New England Water Works Association.

EXPENDITURES.

1901.		
January 4.	Bacon & Burpee, reporting Nov. and Dec., 1901, meetings	$27.50
	Samuel Usher, printing December, 1900, JOURNAL	406.20
12.	Willard Kent, salary and expenses to January 1, 1901	29.17
15.	D. Gillies' Sons, printing	18.55
	Association of Engineering Societies, cuts	2.75
	Charles W. Sherman, salary and expenses to January 1	30.57
16.	Francis L. Pratt, music at January meeting	20.00
22.	J. M. Ham, salary and expenses to January 15	26.76
	Thomas P. Taylor, stereopticon, January 9	10.00
February 15.	Hub Engraving Co., plates	42.60
	Hobbs & Warren Co., letter book and cards	1.95
	D. Gillies' Sons, stamped envelopes and printing	124.25
21.	Francis L. Pratt, music, February meeting	20.00
	J. M. Ham, salary and expenses to February 15	32.27
	Olmsted Bros., illustrations for paper at Rutland	20.00
27.	L. M. Bancroft, revenue stamps	2.00
March 6.	Boston Society of Civil Engineers, rent to February 28	100.00
	Hub Engraving Co., plates	8.52
13.	W. N. Hughes, printing membership list, etc.	89.53
	D. Gillies' Sons, printing	3.25
	Samuel Usher, printing	1.50
	Hobbs & Warren Co., cards	.40
19.	Francis L. Pratt, music, March meeting	20.00
21.	Samuel Usher, printing March JOURNAL	262.30
25.	J. M. Ham, salary and expenses to March 15	28.79
April 4.	Willard Kent, salary and expenses to April 1	101.25
	Charles W. Sherman, salary and expenses to April 1	84.75
29.	Bacon & Burpee, report of Jan., Feb., and March meetings	80.25
	Robert J. Thomas, advertising agent, to April 1	41.75
	D. Gillies' Sons, printing	5.02
May 16.	J. M. Ham, salary and expenses to April 15	26.75
	Hub Engraving Co., cuts	25.08
	Hobbs & Warren Co., book and cards	3.35
	Samuel Usher, printing	13.00
23.	J. C. Whitney, expenses, 1899	70.78
June 18.	W. N. Hughes, envelopes for JOURNALS	45.00
	D. Gillies' Sons, printing circulars	4.75
	Boston Society of Civil Engineers, rent to May 31	100.00
	J. M. Ham, salary and expenses to June 15	56.74
July 22.	Samuel Usher, printing June JOURNAL	267.05
	Charles W. Sherman, salary and expenses to July 1	82.85
	Willard Kent, salary to July 1	50.00
	J. M. Ham, salary and expenses to July 15	26.91
	Robert J. Thomas, advertising agent, to July 1	61.40
	Hobbs & Warren Co., cards	.46
August 27.	Hub Engraving Co., cuts	1.47
	D. Gillies' Sons, receipt book and envelopes	33.50
September 17.	Charles W. Sherman, salary and expenses to October 1	78.34
23.	J. M. Ham, salary and expenses to September 15	50.80
October 10.	J. M. Ham, salary and expenses to October 15	47.03
	D. Gillies' Sons, postal cards and printing	24.25
	Boston Society of Civil Engineers, rent to August 31	100.00
	Willard Kent, salary and expenses to October 1	73.27
19.	Robert J. Thomas, advertising agent, to October 1	70.25
November 14.	D. Gillies' Sons, printing	4.25
	W. N. Hughes, printing	5.25
	J. M. Ham, salary and expenses to November 15	27.01
	Samuel Usher, printing September JOURNAL	353.25
	Bacon & Burpee, report of Annual Convention	45.00
December 20.	Hobbs & Warren Co., stationery	2.25
	W. N. Hughes, binding and cards	15.00
	J. M. Ham, salary and expenses to January 1, 1902	44.34
	Boston Society of Civil Engineers, rent to November 30	100.00
	Hub Engraving Co., plates	25.81
	Francis L. Pratt, music, December meeting	20.00
	Willard Kent, salary and expenses to January 1, 1902	81.00
	Charles W. Sherman, salary and expenses to January 1, 1902	80.00
	Thomas P. Taylor, stereopticon, December meeting	10.00
	Robert J. Thomas, advertising agent, to January 1, 1902	70.95
31.	D. Gillies' Sons, stamped envelopes and printing	88.10
	Bacon & Burpee, reporting November and December meetings	25.75
	Samuel Usher, printing December JOURNAL	307.75
	W. N. Hughes, billheads	5.00
	Henry F. Jenks, expenses, Committee on Exhibits of Associates	17.60
		$4 283.22

BALANCE ON HAND.

Cash	$424.45	
Deposit, Peoples Savings Bank, Worcester	1 293.42	
Deposit, Mechanics Savings Bank, Reading	300.00	
Deposit, First National Bank, Reading	45.70	2 063.57
		$6 346.79

MR. COGGESHALL. How does the balance compare with the balance at the date of the last report?

MR. BANCROFT. It is $44.67 less than at the date of the last report. There have been paid during the year bills contracted during the years 1899 and 1900, amounting to $70.78 and $514.74, respectively. The receipts for the year 1901 were $4 238.55, and the bills paid for the year 1901 were $3 697.70, leaving a balance of receipts over expenditures for the year of $540.85. I know of no outstanding bills which we owe.

On motion of Mr. Brackett, it was voted to accept and print the report of the Treasurer.

Mr. J. W. Crawford, for the Finance Committee, stated that the report of the Treasurer had been examined and found to be correctly cast, with proper vouchers for all expenditures, and the balance correct as stated.

On motion of Mr. Brackett, the report of the Finance Committee was accepted.

REPORT OF THE SECRETARY.

The Secretary, Mr. Willard Kent, submitted the following: —

Mr. President and Gentlemen of the New England Water Works Association, — I have the honor to submit the following report as Secretary: —

STATISTICS RELATING TO MEMBERSHIP FOR YEAR ENDING DECEMBER 31, 1901.

January 1, 1901.	Total membership		606

ACTIVE MEMBERS.

January 1, 1901.	Total active membership		530
	Withdrawals:		
	Resignations	8	
	Dropped	61	
	Died	8	77
			453
	Initiations:		
	January	6	
	February	1	

	March	7		
	June	9		
	September	12		
	November	5		
	December	0	40	493

HONORARY MEMBERS.

January 1, 1901.	Honorary members	4	
January 1, 1902.	Honorary members		4

ASSOCIATES.

January 1, 1901.	Total associate membership		72	
	Withdrawals:			
	Resigned	9		
	Dropped	9	18	
			54	
	Initiations:			
	January	1		
	February	1		
	March	0		
	June	1		
	September	1		
	November	0		
	December	0	4	58
January 1, 1902.	Total membership			555

SUMMARY OF RECEIPTS OF THE NEW ENGLAND WATER WORKS ASSOCIATION FOR THE YEAR ENDING DECEMBER 31, 1901.

Dues	$1 759.00
Advertising	1 750.50
JOURNALS sold	315.68
Initiation	266.00
Sundry	75.95
Subscriptions	26.75
Total	$4 193.88

SUMMARY OF EXPENSES OF THE NEW ENGLAND WATER WORKS ASSOCIATION FOR YEAR ENDING DECEMBER 31, 1901.

JOURNAL	$1 366.55
Stationery and printing	414.78
Rent	400.00
Assistant Secretary	312.50

Editor	300.00
Expenses	259.30
Advertising Agent	244.35
Secretary	200.00
Stenographer	151.00
Music	80.00
Stereopticon	20.00
Slides	20.00
Total	$3 768.48

Amount of Receipts above Expenditures..... $425.40

At the present time there is due the Association $520.50 for annual dues, $408.75 for advertising, and $10.75 for sundry items, such as reprints, etc., making a total of $940. I know of no outstanding bills against the Association.

Respectfully submitted,

(Signed) WILLARD KENT,
Secretary.

On motion of Mr. Coggeshall, the report was accepted and ordered printed in the JOURNAL.

Mr. Charles W. Sherman, Editor, then read his report.

REPORT OF THE EDITOR OF THE JOURNAL.

BOSTON, January 1, 1902.

To the President and Members of the New England Water Works Association :

The following is a report for Volume XV of the JOURNAL, including the six issues from September, 1900, to December, 1901, and covering the nineteen months from June 1, 1900, to date.

Table No. 1 gives a detailed statement of the material in this volume of the JOURNAL; while Tables Nos. 2 and 3 show in detail the receipts and expenses, on account of the JOURNAL, for the nineteen months and for the year, respectively. The increase in the amount of advertising since the election of Mr. R. J. Thomas as Advertising Agent is worthy of note, as is also the fact that the net cost of the JOURNAL for the year 1901, as shown by Table No. 3, was nothing. It is to be noted that no part of the dues from members is included in the receipts.

TABLE No. 1. — Statement of Material in Volume XV, Journal of the New England Water Works Association, 1900–01.

Number.	Date of Issue.	Number of Pages of									Cuts.
		Papers.	Proceedings.	Volume Index, etc.	Total Text.	Advertisements.	Covers and Contents.	Inset Plates.	Membership List.	Total.	
1	September, 1900..	93	3	...	96	20	5	4	...	125	3
2	December, 1900...	97	31	...	128	18	5	10	...	161	12
3	March, 1901.....	63	11	...	74	22	5	11	48	160	9
4	June, 1901.....	61	7	...	68	28	4	7	...	107	4
5	September, 1901..	74	18	...	92	30	4	...	...	126	1
6	December, 1901...	70	2	14	86	30	4	5	...	125	...
	Totals.....	458	72	14	544	148	27	37	48	804	29

TABLE No. 2. — Expenditures and Receipts on Account of Volume XV, Journal of the New England Water Works Association, 1900–01.

Expenditures.		Receipts.	
Printing Journal	$1 848.88	Advertising	$2 338.00
Engraving, etc.	143.60	Sale of Journals	334.23
Postage on Journal	41.94	Sale of Reprints	30.20
Editor's Salary	475.00	Sale of Cuts	16.85
Advertising Agent, Com. .	244.35	Subscriptions	72.75
Copyright Fees	3.00		$2 792.03
Incidentals	36.76		
Reporting Meetings . . .	270.35		
Compiling Statistics, 1897–8–9	25.00		
Reprints of Papers	162.00		
Blank Forms for Statistics .	40.50	Excess of Expenditures . .	499.35
	$3 291.38		$3 291.38

TABLE No. 3. — Expenditures and Receipts on Account of the Journal of the New England Water Works Association, during 1901.

Expenditures.		Receipts.	
Printing Journal	$1 125.88	Advertising	$1 750.50
Engraving, etc.	78.40	Sale of Journals	315.68
Postage on Journal	31.94	Sale of Reprints	30.20
Editor	300.00	Sale of Cuts	16.85
Advertising Agent	244.35	Subscriptions	26.75
Copyright Fees	2.00		
Incidentals	13.25		
Reporting Meetings	151.00		
Reprints of Papers	105.00		
Blank Forms for Statistics	40.50		
	$2 092.32		
Excess of Receipts	47.66		
	$2 139.98		$2 139.98

As usual, fifty reprints of papers have been furnished to their authors without charge. Where a larger number were wanted, they have been supplied at cost. The expense to the Association for these reprints has averaged $4.69 for each paper.

The total cost of the illustrations for the volume has been $307.60, or 9.4 per cent. of the gross cost. This is somewhat less than in Volume XIV, where the percentage was 11.

The present circulation of the Journal is, —

Members	555
Subscribers	47
	602

Exchanges are made with fifteen periodicals.

As far as I know, there are no bills outstanding against the Association on account of the Journal.

TABLE No. 4.

Comparison between Volumes XIV and XV, Journal of the New England Water Works Association.

	Vol. XV Complete.	Vol. XV One Year.	Vol. XIV.
Edition (copies)	1 200	1 200	1 100
Numbers issued	6	4	4

Average membership	586	586	601
Pages of text	544	363	345
Pages of text per 1 000 members	926	618	600
Total pages, all kinds	804	536	485
Total pages per 1 000 members	1 370	913	832
GROSS COST:			
Total	$3 291.38	$2 194.26	$1 954.15
Per page	4.10	4.10	4.03
Per member	5.62	3.75	3.35
Per member, per 1 000 pages	6.99	6.99	6.91
Per member per 1 000 pages of text	10.31	10.31	9.71
NET COST:			
Total	$499.35	$332.90	$347.55
Per page	0.62	0.62	0.72
Per member	0.85	0.57	0.60
Per member per 1 000 pages	1.06	1.06	1.23
Per member per 1 000 pages of text	1.57	1.57	1.73

Respectfully submitted,

CHARLES W. SHERMAN,
Editor.

On motion of Mr. Cassell, it was voted that the report of the Editor be accepted and printed in the JOURNAL.

REPORT OF THE ADVERTISING AGENT.

The following report of Mr. Robert J. Thomas, Advertising Agent, was read by Mr. Sherman, Mr. Thomas being absent on account of illness.

LOWELL, January 1, 1902.

TO THE PRESIDENT AND MEMBERS OF THE NEW ENGLAND WATER WORKS ASSOCIATION:

Gentlemen, — I herewith present the annual report of the Advertising Agent for the year 1901: —

The last issue of the JOURNAL for 1900 contained the following advertisers: National Meter Co., 1 page; Hersey Mfg. Co., 1 page; Thomson Meter Co., 1 page; Union Water Meter Co., 1 page; Neptune Meter Co., ½ page; The Peck Bros. & Co., ½ page; Walworth

Mfg. Co., 1 page; Chadwick Lead Works, 1 page, Boston Lead Mfg. Co., ½ page; Lead-Lined Iron Pipe Co., ½ page; R. D. Wood & Co., 1 page; Sweet & Doyle, 1 page; Ludlow Valve Mfg. Co., ½ page; Emaus Pipe Foundry, ½ page; United States Cast-Iron Pipe and Foundry Co., 1 page; Warren Foundry and Machine Co., ½ page; M. J. Drummond & Co., ½ page; Builders Iron Foundry, 2 half-pages; New York Filter Mfg. Co., ½ page; E. P. Allis, 1 page; Perrin, Seamans & Co., ½ page; Gould Packing Co., ½ page; Lawrence Cement Co., ⅓ page; making a total of 16⅔ pages and an income of $1 135.

During 1901 the Edward P. Allis Co. and Sweet & Doyle refused to renew their advertisements, and the Boston Lead Mfg. Co. having been merged into the Chadwick-Boston Lead Works, another half-page was lost. With the foregoing exceptions all the advertisers renewed their contracts. The National Meter Co. increased their advertisement to 2 pages, the Neptune Meter Co. and the Lead-Lined Iron Pipe Co. increased their space from ½ page to a full page each, and the following new advertisers were added: The Sumner & Goodwin Co., 1 page; A. P. Smith Mfg. Co., ½ page; J. B. Campbell Brass Works, ½ page; Eddy Valve Co., ½ page; Kennedy Valve Mfg. Co., ½ page; Coffin Valve Co., ½ page; Rensselaer Mfg. Co., ½ page; B. F. Smith & Bro., ½ page; Barr Pumping Engine Co., 1 page; Eagle Oil and Supply Co., 1 page; International Steam Pump Co., 1 page; Jenkins Bros., 1 page; Garlock Packing Co., ½ page; National Paint and Varnish Co., ½ page; Boston Engineers' Supply Co., ½ page; A. W. Chesterton & Co., ½ page; Ashton Valve Co., ¼ page; Scannell & Wholey, ¼ page; Mason Regulator Co., ¼ page; and card advertisements from Davis & Farnum Mfg. Co., National Lead Co., and Thomas Watkins, making a total of 27⅓ pages, earning $1 929, an increase in revenue from this source of $794.

That this amount can be still further increased is true beyond doubt, for there are a number of manufacturers and dealers in waterworks supplies that are not as yet among our advertisers, and this notwithstanding the efficiency of the JOURNAL as a medium for reaching the six hundred members of the Association, most of whom buy thousands of dollars worth of supplies every year. But the members must make it an object for advertisers. By this I mean that you should give them consideration when you are about to purchase, and give them an opportunity to submit prices, etc. It seems as

though every member who has the interests of the Association truly at heart should do this.

Of the many advantages and benefits that we have to offer to our members the JOURNAL is the greatest. To be sure, it is very enjoyable and instructive to attend our meetings in Boston and elsewhere, but later on if you want to profit by the papers you have heard here, you have to refer to the JOURNAL. Then, again, there is the twenty-five per cent. of the members who are too far away to attend these meetings, — those in New York, New Jersey, Canada, and other places, — all the benefit they receive is from the JOURNAL. Therefore, it is our duty to make the JOURNAL as able, thorough, and efficient as possible, and, in doing this, the income from the advertising will be a material aid.

Hoping that the number of advertisers will keep on increasing, and that those now advertising with us will find it profitable to continue, this report is respectfully submitted.

ROBERT J. THOMAS,
Advertising Agent.

THE PRESIDENT. The report of our Advertising Agent, with what has gone before it, shows conclusively that we made no mistake in the action taken at Rutland with regard to securing advertising matter for the JOURNAL. There are many of us who, earlier in life, have experienced the difficulty of inducing schoolboys or college boys to recognize the necessity and the propriety of contributing to the support of their school or college papers by patronizing the advertisers in them; but it would seem that with us older men it should not be necessary to lay so great stress upon the propriety and advisability of so doing.

On motion of Mr. Stacy, the report of the Advertising Agent was accepted and ordered to be printed in the JOURNAL.

ELECTION OF OFFICERS.

Mr. D. N. Tower, for the tellers of election, submitted the following report: —

Total number of votes, 168; 1 vote was blank, and 167 votes were cast for the official ballot as follows: —

President.

FRANK E. MERRILL, Somerville, Mass.

Vice-Presidents.

CHARLES K. WALKER, Manchester, N. H.
JAMES BURNIE, Biddeford, Me.
EDWIN C. BROOKS, Cambridge, Mass.
H. O. SMITH, Leicester, Mass.
WILLIAM B. SHERMAN, Providence, R. I.
J. C. HAMMOND, Jr., Rockville, Conn.

Secretary.

WILLARD KENT, Narragansett Pier, R. I.

Treasurer.

LEWIS M. BANCROFT, Reading, Mass.

Editor.

CHARLES W. SHERMAN, Boston, Mass.

Advertising Agent.

ROBERT J. THOMAS, Lowell, Mass.

Additional Members of Executive Committee.

PATRICK KIERAN, Fall River, Mass.
GEORGE A. STACY, Marlboro, Mass.
H. G. HOLDEN, Nashua, N. H.

Finance Committee.

A. W. F. BROWN, Fitchburg, Mass.
W. F. CODD, Nantucket, Mass.
J. W. CRAWFORD, Lowell, Mass.

The above-named gentlemen were declared elected. President Merrill was called to the chair by the retiring President, Mr. Crandall, and addressed the meeting as follows: —

Gentlemen, — In assuming the duties and responsibilities of the high office of President of the New England Water Works Association, I desire to take the opportunity to thank you heartily for the honor you have conferred upon me. I am sure that I shall have the cordial support which you have given to former presidents, and in return I pledge you my earnest efforts to do what I can to see that the Association does not fall from the high plane which it now occupies. [*Applause.*]

On motion of Mr. Coggeshall, the thanks of the Association were tendered to the retiring President and other officers.

Mr. Joseph E. Beals, Chairman of the Committee on Uniform Statistics, presented the report in behalf of that committee. A communication was read from Mr. M. N. Baker, and the committee was continued, with the addition of Mr. Baker and Mr. Charles W. Sherman as members, with instructions to make such further investigation as might be deemed expedient.

The discussion of the report of the Committee on Standard Specifications for Cast-Iron Pipe, presented at the December meeting, was continued by Mr. Leonard Metcalf and by Mr. Coffin and Mr. Brackett, members of the committee. Written discussions were also presented from the British Association of Water Works Engineers, Mr. George E. Manning, of New London, and others.

No action was taken upon the report of the committee.

Adjourned.

PROCEEDINGS.

FEBRUARY MEETING.

YOUNG'S HOTEL,
BOSTON, February 12, 1902.

President Frank E. Merrill in the chair.

The following members and guests were in attendance: —

MEMBERS.

L. M. Bancroft, Joseph E. Beals, James F. Bigelow, Dexter Brackett, E. C. Brooks, Fred Brooks, G. A. P. Bucknam, George Cassell, George F. Chace, John C. Chase, W. F. Codd, R. C. P. Coggeshall, M. F. Collins, L. E. Daboll, Charles R. Felton, R. J. Flinn, F. F. Forbes, William Paul Gerhard, H. F. Gibbs, J. C. Gilbert, Albert S. Glover, J. A. Gould, E. H. Gowing, William R. Groce, E. A. W. Hammatt, J. C. Hammond, Jr., George W. Harrington, D. A. Harris, L. M. Hastings, V. C. Hastings, T. G. Hazard, Jr., H. G. Holden, E. W. Kent, Willard Kent, C. F. Knowlton, James W. Locke, W. E. Maybury, F. A. McInnes, T. H. McKenzie, Thomas McKenzie, F. E. Merrill, G. L. Mirick, F. L. Northrop, W. W. Robertson, E. M. Shedd, Charles W. Sherman, J. E. Smith, Sidney Smith, J. A. St. Louis, G. A. Stacy, Robert W. Taber, C. N. Taylor, H. E. Thomas, R. J. Thomas, D. N. Tower, W. H. Vaughan, W. W. Wade, C. K. Walker, F. B. Wilkins, G. E. Winslow.

ASSOCIATES.

Harold L. Bond & Co., by Harold L. Bond; Builders Iron Foundry, by H. J. Burroughs and James Bowie; Charles A. Claflin & Co., by Charles A. Claflin; Coffin Valve Co., by H. L. Weston; Hersey Mfg. Co., by James A. Tilden and Albert S. Glover; Kennedy Valve Co., by M. J. Brosman; Lead-Lined Iron Pipe Co., by Thomas E. Dwyer; Ludlow Valve Co., by H. F. Gould and S. F. Ferguson; National Meter Co., by J. G. Lufkin; Neptune Meter Co., by H. H. Kinsey; Perrin, Seamans & Co., by James C. Campbell; Rensselaer Mfg. Co., by Fred S. Bates; A. P. Smith Mfg. Co., by W. H. Van Winkle; Union Water Meter Co., by J. P. K. Otis, F. L. Northrop, and Charles L. Brown; United States Cast-Iron Pipe and Foundry Co., by John M. Holmes; R. D. Wood & Co., by Charles R. Wood.

GUESTS.

George H. Hart, Superintendent Water Works, Maynard, Mass.; George H. Partridge, *Engineering Record*, Boston, Mass.; George H. Leland, C. E., Providence, R. I.; John C. DeMello, Jr., New Bedford, Mass.; J. B.

Moore, Boston, Mass.; H. V. Macksey, Boston Water Works, Boston, Mass.; L. P. Stone, Natick, Mass.; Charles F. McCarthy, Worcester, Mass.; A. H. Robinson and E. L. Arundel, Water Commissioners, Lawrence, Mass.; W. Killan, Lawrence, Mass.; Clarence Goldsmith, North Andover, Mass.; John A. Connell, Charles A. Cook, J. Henry Gleason, H. J. Pratt, J. P. Wood, E. S. Murphy, H. C. Hunter, C. A. French, Louis P. Howe, E. Irving Sawyer, Walter P. Frye, O. H. Stevens, and Thomas P. Hurley, Water Commissioners and guests, Marlboro, Mass.

The Secretary read the following names of applicants for membership, the applications having been approved by the Executive Committee: —

For Resident Members.

Jeremiah H. Bartholomew, Ansonia, Conn.

A. M. Devereux, Castine, Me., Treasurer and Manager of the Castine Water Co.

Benjamin F. Goodnough, Brookline, Mass., Engineering Department Metropolitan Water Works.

Louis B. Cummings, Pittsfield, Mass., Clerk Board of Public Works.

George H. Hart, Maynard, Mass., Superintendent and Engineer of Maynard Water Works.

Andrew S. Merrill, Bath, Me., Superintendent Bath Division of Maine Water Co.

W. S. Wyman, Waterville, Me., Trustee Kennebec Water District.

Arthur B. Lisle, Providence, R. I., Treasurer of East Providence Water Co.

Edward Brown, Norfolk, Conn., Engineer and Superintendent Norfolk Water Co.

For Non-Resident Members.

William B. Fuller, Little Falls, N. J., Resident Engineer East Jersey Water Co.

William B. Brush, Brooklyn, N. Y., Civil Engineer.

For Associate.

The Thomas Hoey Supply and Manufacturing Co., Boston, Mill and Water Works Supplies.

On motion of Mr. Cassell, the Secretary was directed to cast one ballot in favor of the applicants, which he did, and they were declared elected members of the Association.

Mr. Charles W. Sherman, in behalf of the Boston Society of Civil Engineers, extended an invitation to the members of the Association to attend an informal meeting of the Boston Society, to be held in the evening, when Mr. F. E. Adams, of the Coffin Valve Co., would speak on "Essential Features of Gate Valve Construction."

Mr. George A. Stacy, Superintendent, Marlboro, Mass., then gave a description of the Marlboro Water Works, illustrating his remarks by stereopticon views.

Mr. Harry F. Gibbs, Engineer Water Works Pumping Station, Natick, Mass., read a paper entitled, "How to Obtain the Best Results in Small Pumping Stations." Mr. William F. Codd, Superintendent, Nantucket, Mass., followed with a short paper descriptive of a gasolene engine and its use as a reserve pumping plant in the Nantucket Works. Mr. D. N. Tower, Superintendent of the Cohasset Water Company, also spoke in regard to the Hornsby-Akroid kerosene oil engine in use at Cohasset.

Owing to the lateness of the hour, the further discussion of the report of the Committee on Standard Specifications for Cast-Iron Pipe was postponed to the next meeting.

Adjourned.

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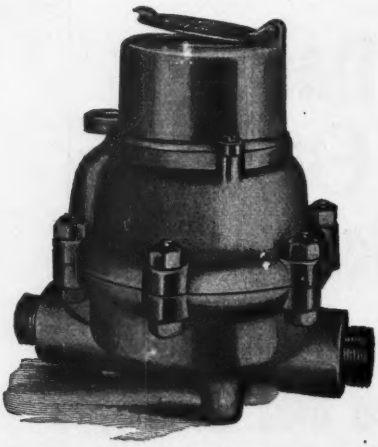

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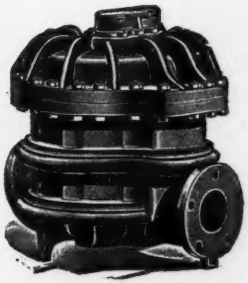

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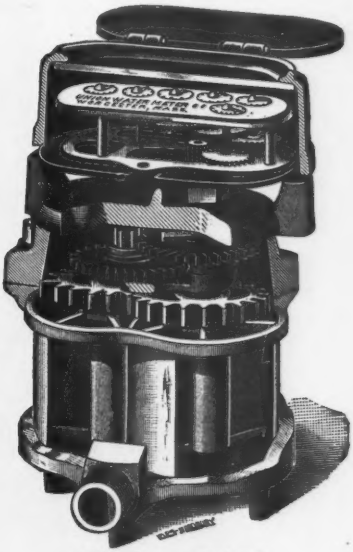

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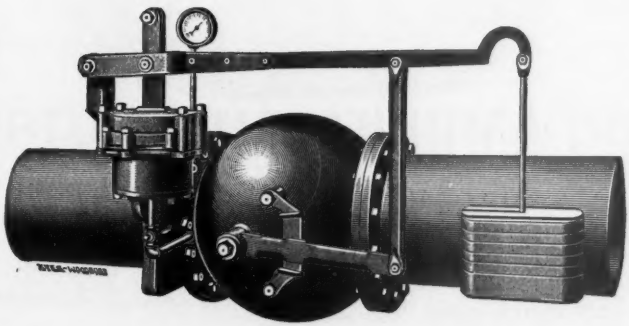

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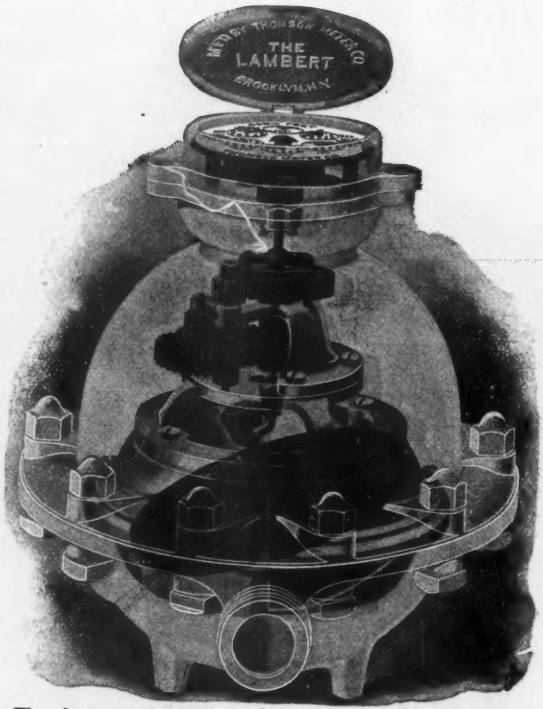

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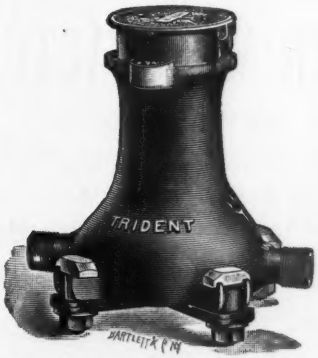

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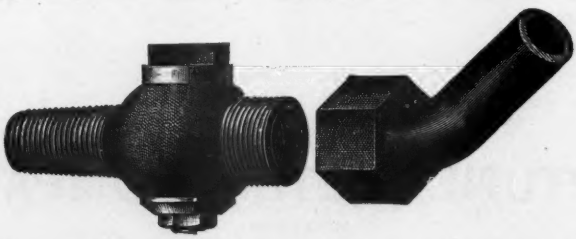

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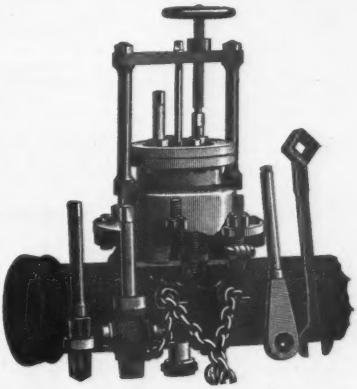

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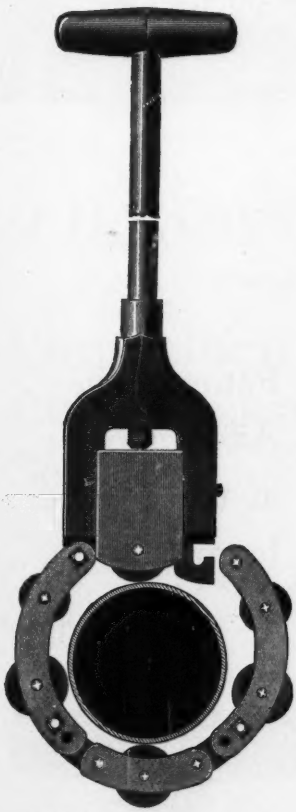

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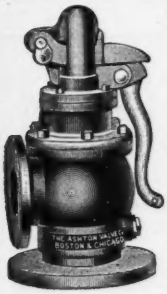

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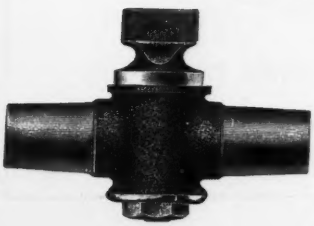

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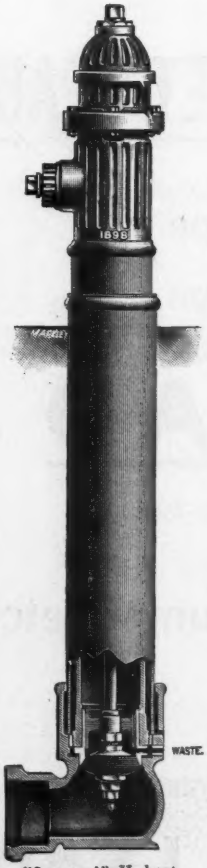

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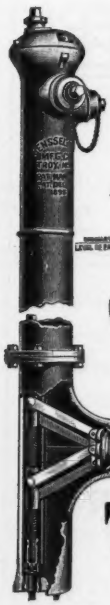

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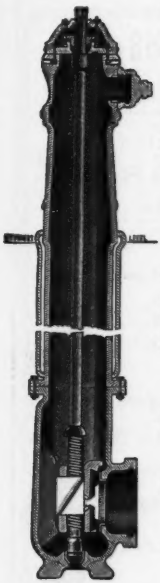

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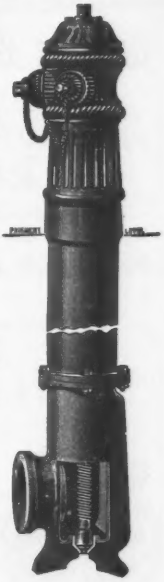

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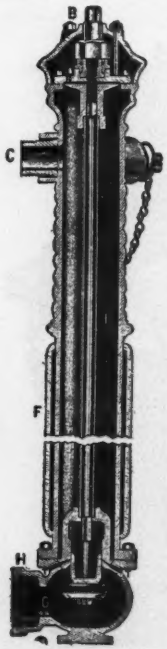

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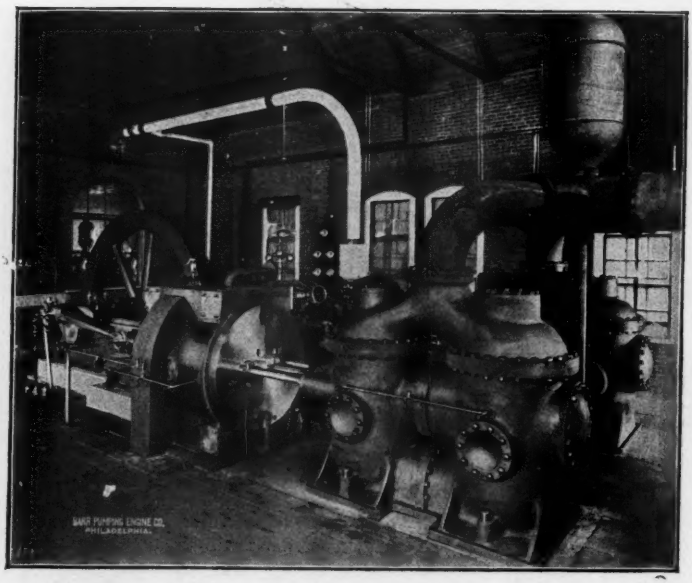

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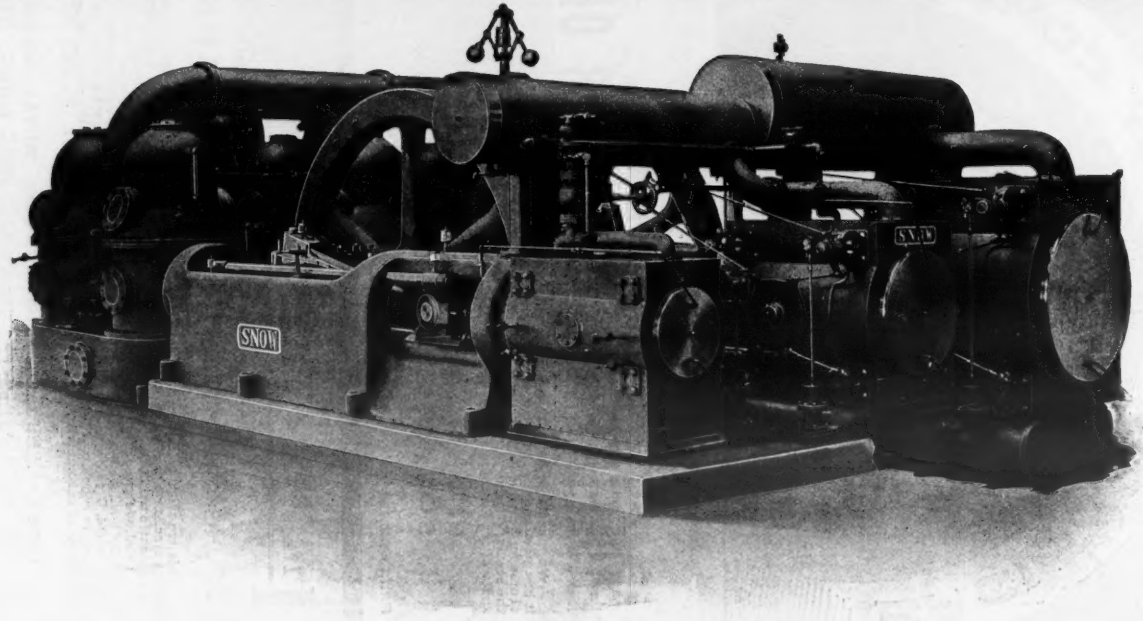

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EAGLEINE HIGH PRESSURE CYLINDER OIL

We manufacture an Oil especially adapted for pumping machinery, and in all cases it has given excellent results. Many members of this Association have been customers of ours for years, and speak in the highest terms of our **Eagleine Cylinder Oil**, and the results obtained by its use have been very satisfactory. We solicit a trial order, and will send a sample barrel on thirty or sixty days' trial.

NEW ENGLAND AGENTS FOR

SOLARINE METAL POLISH

For Brass, Steel, and Nickel-plate

FREE SAMPLE

IMPORTANT...

In connection with our Oil and Grease Departments we have a

SUPPLY DEPARTMENT

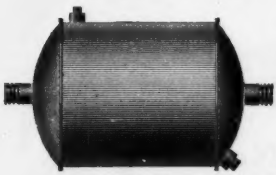
This we wish to call your special attention to for the following reasons: First, we carry a stock of supplies used in Pumping Stations second to none in our city; Second, we guarantee to deliver exactly what we represent, and will stand all expenses if we do not; Third, we can deliver goods promptly, and our prices are low for what we deliver; Fourth, by having such an extensive supply department to order from it enables you to keep your Oil, Grease, and Supply account under one head. REMEMBER that we keep everything in supplies, and everything in our place in its place. We invite inspection. Catalogues of our numerous specialties sent free.

"With EAGLEINE OILS and SOLARINE METAL POLISH
We Lubricate and Shine where others fail"

Artesian and Driven Wells.

WE have had over twenty-four years' experience in supplying cities, towns, and large corporations by the Artesian and Driven Well system. Also driven many thousand wells for domestic purposes.

Sand and Vacuum Chambers.

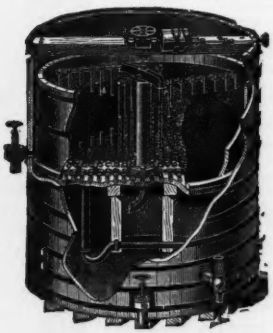


HORIZONTAL.

We have patented and manufacture sand chambers. Smaller sizes fitted for 1½-in. to 6-in. pipes, made of heavy hammered copper, guaranteed not to leak or collapse. Larger chambers for water works where from 500,000 to 6,000,000 gallons of water are pumped, made of wrought-iron, fitted with 8-in. to 20-in. pipe. All chambers are warranted to stop sand, or money refunded, if we know the quantity of water to be pumped and the quality of sand. Call on or address,

B. F. SMITH & BRO., 38 Oliver Street, Boston.

J. S. D. M.



GRAVITY AND PRESSURE FILTERS

Constructed under the
JEWELL, WARREN AND HYATT PATENTS.

"The Acknowledged Standard of Mechanical Filtration."
Adopted by 152 cities.

Patents Sustained by the Highest Courts. Highest Efficiency. Lowest Prices.

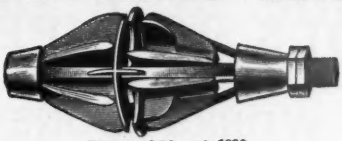
NEW YORK CONTINENTAL JEWELL FILTRATION CO.

15 BROAD STREET, NEW YORK.

S. D. M. J.

MEMBERS of the New England Water Works Association, when about to purchase supplies, should always consult the advertising pages of the JOURNAL, and at least allow the advertisers a chance to submit prices. When writing to advertisers always mention this JOURNAL.

Notice the Blades--Have You?



Patented May 12, 1896.

Its Cleaning Blades have unrivaled cleaning efficiency, but cannot injure the tubes.

Its Cleaning Blades lose no effectiveness by wear until worn to limit of wear adjustment; they are then easily and quickly removed and new ones substituted.

Its Cleaning Blades and their controlling springs are the only wearing points and can be had by return mail on application to us, or any of our agencies.

Its Cleaning Blades always wear sharp.

AGENCIES:

CHICAGO, ILL.
11 South Canal Street.

MANCHESTER, N. H.
972 Elm Street.

BUTTE, MONT.
216-218 No. Main Street.

TOLEDO, OHIO.
Cor. Summit and Jefferson Sts.

AMSTERDAM, N. Y.
5 Market Street.

NORTH ADAMS, MASS.
64 Main Street.

HOLYOKE, MASS.
73-75 Main Street.

ROCHESTER, N. Y.
67-71 Exchange Street.

SPRINGFIELD, MASS.
41 Taylor Street.

BOSTON, MASS.
104 Broad Street.

TROY, N. Y.
179 River Street.

PEABODY, MASS.
29 Main Street.

LAWRENCE, MASS.
582 Essex Street.

GREENFIELD, MASS.
Cor. Main St. and Bank Row.

NEW YORK CITY, N. Y.
18 Warren Street.

BUFFALO, N. Y.
81 Main Street.

FALL RIVER, MASS.
139 Pleasant Street.

TAUNTON, MASS.
8 Union Block.

PROVIDENCE, R. I.
47 Exchange Place.

NEW HAVEN, Conn.
292 State Street.

DETROIT, MICH., Cor. First and Woodbridge Streets.

THE CHALLENGE TUBE CLEANER CO.

63 MARKET STREET, LOWELL, MASS.

PERRIN, SEAMANS & CO.

57 OLIVER STREET, BOSTON, MASS.

TOOLS AND SUPPLIES

FOR

WATER WORKS CONSTRUCTION

Send for Catalogue No. 6.

S. D. M. J.

Water is not Tainted by this Paint

OFFICE OF
HARRY P. HUMBERT,
CITY CLERK.

KEITHSBURG, ILL.,
October 23rd, 1899.

The National Paint and Varnish Company,
Manufacturers of Graphite Paints and Varnishes,
Cleveland, Ohio.

GENTLEMEN:

Your letter of the 8th is at hand, acknowledging receipt of the money sent you in payment for the paint purchased of your agent, that we painted our Stand Pipe with. Will say that we painted the stand pipe inside and out with your paint. So far it has given very excellent satisfaction. It has the body, together with the staying qualities, and to any one needing a paint for iron or steel, must say that they could not do better than to purchase your paint. In conclusion, will say that we have not had one complaint from the water being tainted by the paint since the water was turned on after finishing the painting, and we did not give it much time after the paint was put on. Hoping that you will have good success with your paints, as you deserve it, we remain,

Yours truly,

Approved: TOM A. MARSHALL,
Mayor.

Attest:
HARRY P. HUMBERT,
City Clerk, and Supt. Water Works.

S. D. M. J.

E. P. McDONOUGH. HENRY M. CLARK.

Boston Engineers' Supply Co.,

RUBBER HOSE, BELTING AND PACKING,

Oils and Mill Supplies,

ENGINE PACKINGS, GREASE AND SPECIALTIES,

No. 143 Broad Street,

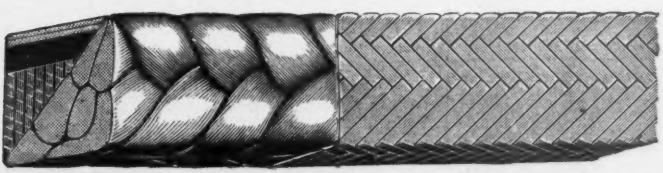
TELEPHONE, BOSTON 3559-2. **BOSTON.**

Handlers of "Highest Grades Cylinder Oils."

M. J. S. D.

"Combination"

HYDRAULIC AND STEAM PACKING



PATENT APPLIED FOR.

An Elastic Sectional Rod and Plunger Packing.

A. W. CHESTERTON & CO.,

64 India Street, Boston.

M. J. S. D.

THE GOULD PACKING CO.

Gould's Packing

Trade Mark.

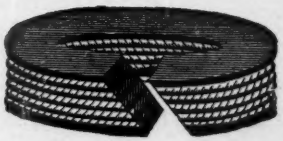
If you want the best, get

Gould's Steam and Water Packing ....

The original ring packing

Buyers will see that our name, Gould's Steam and Water Packing, and our Trade Mark are stamped on every package. *Unless so stamped they are imitations.*

In ordering be careful to give the EXACT diameter of stuffing-box and of piston-rod or valve-stem.



88 Cambridge Street, East Cambridge, Mass.

S. D. M. J.

Packings that Pack

HIGH PRESSURE

WATERPROOF HYDRAULIC

GARLOCK HIGH PRESSURE RING is made especially for high steam pressures. The rubber cushion is on the **INSIDE**, and can't be damaged by oil or intense heat — the fibrous matter is absolutely **HEAT PROOF.** It positively cannot bake, vulcanize or "burn out"; it must **WEAR** out. It gives from four to six times the service of any other fibrous steam packing.

WE GUARANTEE THAT IT WILL EASILY OUTWEAR ALL OTHERS, OR WILL COST YOU NOTHING

GARLOCK WATERPROOF HYDRAULIC is positively without an equal for cold water. It is used by the U. S. Government on the disappearing gun carriages of all coast fortifications, and against hydraulic pressures of from 1000 to 2500 pounds per square inch. Used by City of New York, Boston, Lowell, Lawrence, and most of the large pumping stations in this country. It will easily outwear any others on cold-water plungers and rods.

OUR OFFER is to make you up a set of either of these and if not the best you've ever used, we won't charge you a cent. You can be the judge.

CAN'T YOU GIVE US A TRIAL?

THE GARLOCK PACKING CO.

All kinds of Packings and Engineers' Supplies

12 Pearl Street . . . . Boston

New York San Francisco Chicago Philadelphia Denver St. Louis Pittsburgh Cleveland
Palmyra, N. Y. Rome, Ga.

I. S. D. M.

The Journal of the New England Water Works Association

is a quarterly publication, containing the papers read at the meetings, together with verbatim reports of the discussions. Many of the contributions are from writers of the highest standing in their profession. It affords a convenient medium for the interchange of information and experience between the members, who are so widely separated as to find frequent meetings an impossibility. Its success has more than met the expectation of its projectors; there is a large and increasing demand for its issues, and every addition to its subscription list is a material aid in extending its field of usefulness. ALL MEMBERS OF THE ASSOCIATION RECEIVE THE JOURNAL IN PART RETURN FOR THEIR ANNUAL DUES; to all others the subscription is three dollars per annum.

TO ADVERTISERS

THE attention of parties dealing in goods used by Water Departments is called to the JOURNAL OF THE NEW ENGLAND WATER WORKS ASSOCIATION as an advertising medium.

Its subscribers include the principal WATER WORKS ENGINEERS and CONTRACTORS in the United States. The paid circulation is NEARLY 700 COPIES.

Being filled with original matter of the greatest interest to Water Works officials, it is PRESERVED and constantly REFERRED TO BY THEM, and advertisers are thus more certain to REACH BUYERS than by any other means.

300 copies of each issue are sent to Water Works, thus reaching *every Water Department in the United States and Canada* nearly once each year, and correspondingly enlarging the advertising field.

The JOURNAL is not published as a means of revenue, advertisements being inserted solely to help meet the large expense of publication.

ADVERTISING RATES.

One page, one year, four insertions	Sixty Dollars.
One-half page, one year, four insertions	Forty Dollars.
One page, single insertion	Thirty Dollars.
One-half page, single insertion	Twenty Dollars.
One-twelfth page (card), four insertions	Eight Dollars.

Size of page, 7¾ x 4¼ ins.

A sample copy will be sent on application.

For further information address,

H. J. THOMAS,
(Superintendent, Lowell Water Works,)
Advertising Agent,
LOWELL, MASS.

Or, CHARLES W. SHERMAN,
Editor,
1 Ashburton Place, Boston, Mass.

Jenkins Pump Valves

FOR HOT WATER SERVICE

FOR COLD WATER SERVICE

OUR Pump Valves for *cold water and air service* are equal to our well-known *hot-water valves.*

For more than a quarter of a century we have tried to make the best *pump valves* that could be produced, REGARDLESS OF COST. We leave it to our many thousands of customers to say how far we have succeeded.

Always sold with a *guarantee* to give satisfaction on any kind of service required.

When ordering pump valves state diameter, thickness, and size of hole; also for what purpose you desire them.

Pump manufacturers and dealers generally will be glad to furnish you; otherwise, send your orders direct.

PUMP VALVES CAN BE FURNISHED FOR ALL MAKES OF PUMPS AT SHORT NOTICE.

JENKINS BROS.

BOSTON

NEW YORK — 17 Pearl Street — CHICAGO

PHILADELPHIA — LONDON, ENGLAND

J. S. D. M.